OPERATION MANUAL

MUTOH SCRIBER

ET1500

MUTOH

We would like to express our appreciation for your purchase of the ET1500 Scriber. The ET1500 is a powerful drafting tool, designed by MUTOH engineers to eliminate the troublesome task of manual lettering.

To ensure that you get the most out of your new scriber, we recommend that you read carefully and follow the instructions in this document.

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1. INTRODUCTION

The ET1500 provides the following features.

- Program control enables a wide variety of lettering tasks which were formerly possible only manually — at speeds and accuracies faster than with manual lettering.
- The 3MD expansion module is available which provides a variety of lettering styles (fonts) to meet a wide range of specific user requirements.
- The lettering range is up to A4 size and the full width of the size may be used for lettering.
- Half speed key is provided to adjust the speed for various character sizes.
- By using a backup memory module cassette (1MM), frequently repeated phrases or graphics may be stored into memory at 1000 addresses (total memory capacity of up to 7,000 characters).

2. PRECAUTIONS BEFORE USING THE ET1500

The following precautions should be observed with respect to the use of the ET1500.

2.1 Safety Precautions

- Since the ET1500 uses many precision components, never tamper with it, as this can cause failures. Internal inspection and adjustments should be carried out by a qualified service representative.
- Do not allow liquid or dust particles to enter the ET1500 as this can cause failures.
- Do not set the power to OFF or remove the power plug during operation. If power is lost during operation or power is switched OFF (0), the contents of backup memory could be erased.
- Do not rest heavy objects on the connecting cable, bend or pull with undue force as this can cause damage.
- Do not rest heavy objects on the power cable, bend or step on it.
- Do not rest objects onto the top of the display or press on it excessively.
- During use, excessive noise or shock can cause memory contents to be lost and unstability of the functions. If this occurs, set the power switch to OFF and then switch ON once again or press the reset switch and begin anew.
- Do not touch the technical pen cartridge arm during operation.
- Do not forcibly move the technical pen cartridge are with your hand when the power is set to OFF as it can cause damage.
- If the unit becomes soiled, wipe it using a soft cloth. Avoid using thinners, benzene or other chemical solvents as these can damage the outer surfaces of the ET1500.
- Avoid storing or using the ET1500 in locations subjecting it to excessive dust levels, as this can impair proper operation.

- The maximum inclination angle of the drawing board is 20° with the ET1500 mounted to it , if it is used independently of a drafting machine. For use at higher angles of inclination, it has to be mounted on a drafting machine. First check that the vertical brake of the drafting machine has been applied to insure that the unit does not drop. (The operating unit is designed primarily for use on a track-type drafting machine.)

- When using the backup memory module cassettes and setting the power switch to OFF (O), if the LCD display does not appear, it is an indication that the battery has run down.

  Be sure to press the keyboard with fingers. The keyboard may become malfunctinonal if pushed with nail-tip, top of ballpoint pen or similar hard object. (See fig. 2-1, 2-2)

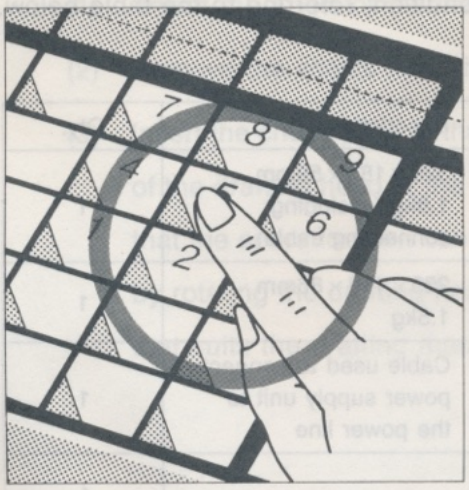


Fig. 2-1

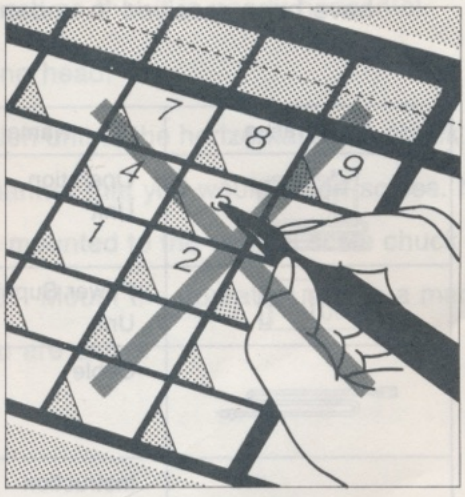


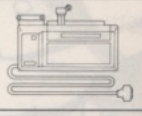
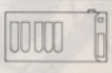
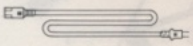
Fig. 2-2

2.2 Storage Precautions

- The ET1500 should not be stored in locations subjecting it to direct sunlight, near heating equipment or other high-temperature locations, or in locations subjecting it to excessive temperature variations. Locations with high humidities and dust levels should also be avoided. In addition, avoid subjecting the ET1500 to excessive shock or twisting stress during operation as this can cause misoperation.
- If the ET1500 is to be left unused for a long period, set the power switch to OFF (0) and remove the power plug from the line outlet. Do not hold the power cord when removing it from the outlet, as this can cause an open at the connector.

2.3 Initial Unpacking and Inspection

When unpacking the ET1500 from its carton, check to determine whether all parts have been received in undamaged condition, referring to the table below.

Appearance	Name	Description	Qty.
	Operation Unit	326 × 185 × 59mm 1.8kg (excluding connecting cable)	1
	Power Supply Unit	239 × 118 × 86mm 1.5kg	1
	Cable	Cable used to connect power supply unit to the power line	1
	Instruction Manual		1
	Fuse		1
	Scale Fixture		1
	Adjustment Screw		1
	Mounting Screw		1
	Technical Pen adapter	For Staedler Marsmatic, Faber Castel and Graphoplex	1 set

3. GENERAL DESCRIPTION AND CONFIGURATION

The ET1500 is a lettering machine which uses a Z-80 CPU to perform pulse motor control. It consists of an operation unit and a power supply unit. The power supply unit is capable of accommodating expansion software, making the ET1500 a versatile, high cost performance lettering machine.

3.1 Operation Unit

The operation unit has a chuck plate which is used to mount it to a drafting machine. When mounting to a drafting machine, the procedure described below should be followed. The operation unit may, of course, be used in stand-alone status also. In such cases, lay the operation unit directly onto the drafting media. When doing this, under no circumstances should the operation unit be held by the cartridge arm.

Mounting Procedure

(1) Adjust the angle of the drafting board so that it is nearly horizontal.

(2) Remove the scales from the drafting head.

(3) Insert the chuck plate of the operation unit to the horizontal scale chuck arm of the drafting head in the same manner that you would insert scales. Note that the operation unit can also be mounted to the vertical scale chuck arm by rotating the drafting head by 90°. Mount the operation unit in a manner that suits the drafting machine you are using.

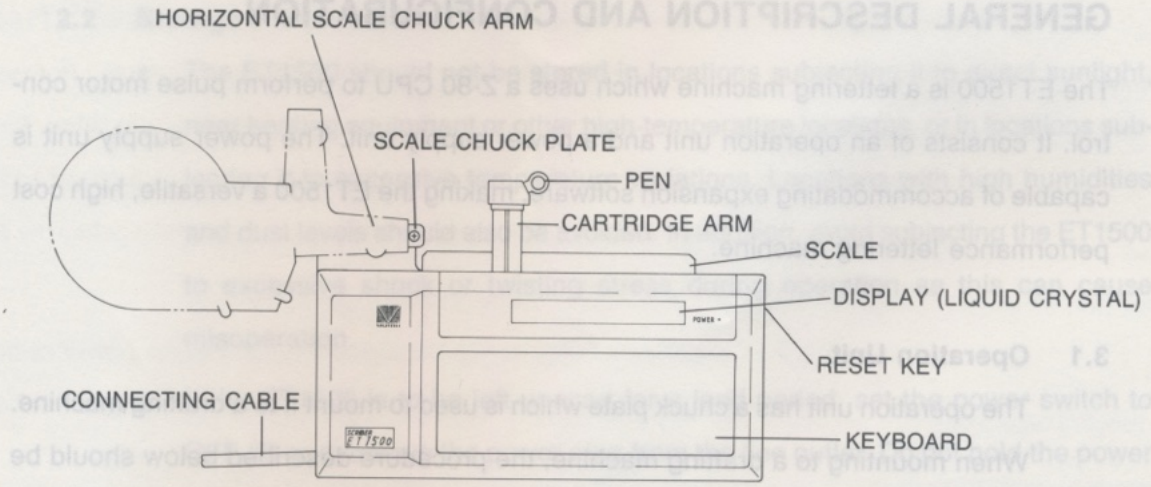


Fig. 3-1 Horizontal scale chuck arm mounting method

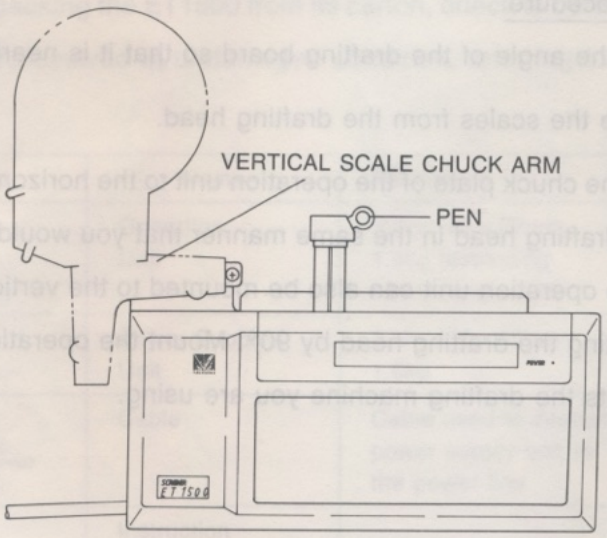


Fig. 3-2 Vertical scale chuck arm mounting method

(4) Adjusting the Parallelness of the Operation Unit

Adjust the chuck plate so that the drafting machine X-axis baseline is aligned with the ET1500 X-axis baseline when it is mounted to the drafting machine head. (This will make it easy to move the symbol in parallel to the X-axis.) Avoid changing the inclination angle to insure high-accuracy lettering.

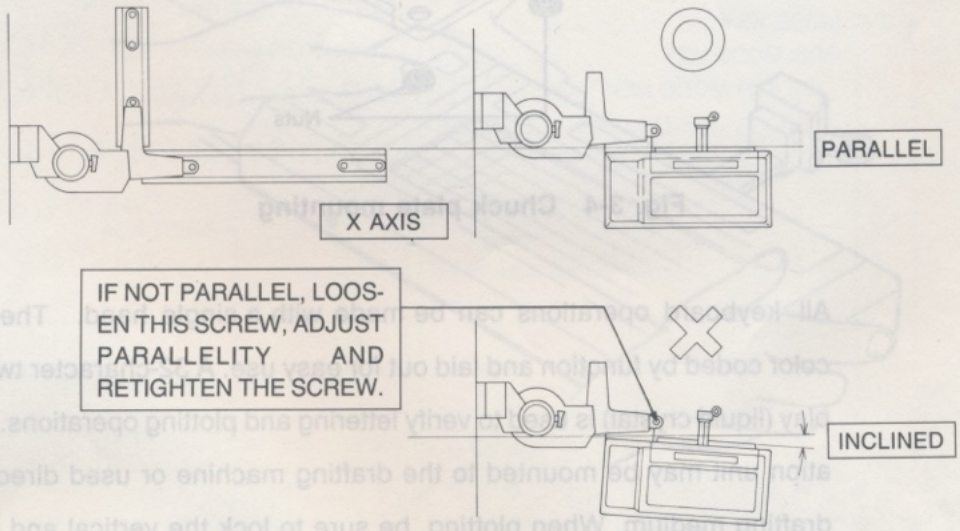


Fig. 3-3 X-Axis alignment procedure

(5) Chuck Plate Mounting

The chuck plate attached as part of the operation unit enables mounting to practically any type of drafting machine. If mounting, however, is not possible, use the separate chuck plate provided as an accessory or use the chuck plate of your drafting scale.

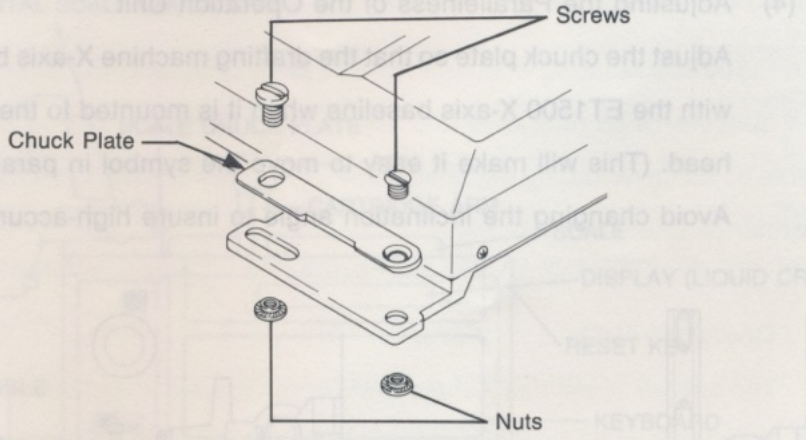


Fig. 3-4 Chuck plate mounting

All keyboard operations can be made with a single hand. The keys are color coded by function and laid out for easy use. A 32-character two-line display (liquid crystal) is used to verify lettering and plotting operations. The operation unit may be mounted to the drafting machine or used directly on the drafting medium. When plotting, be sure to lock the vertical and horizontal brakes.

Characters and numerals are preprogrammed and may be called up from the keyboard. A memory is provided to enable storage of frequently used words and symbols. This type of operation enables high-efficiency lettering. In addition editing of memory contents is possible.

Once setting the power switch to OFF (0), the memory contents will disappear, from the LCD. But data is held in the backup memory module cassettes even with the power switched OFF. (Permanent)

Moving the drafting machine with the operation unit mounted to the drafting head will subject the head to stress. When moving, therefore, always hold the operation unit as shown in the following figure.

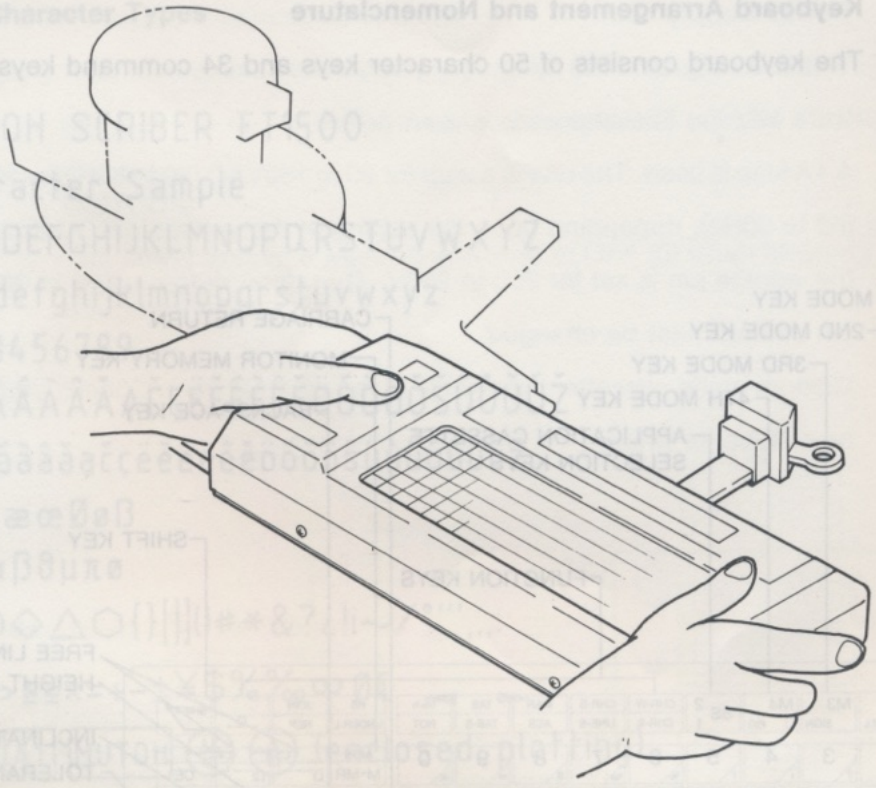


Fig. 3-5

3.2 Keyboard Arrangement and Nomenclature

The keyboard consists of 50 character keys and 34 command keys.

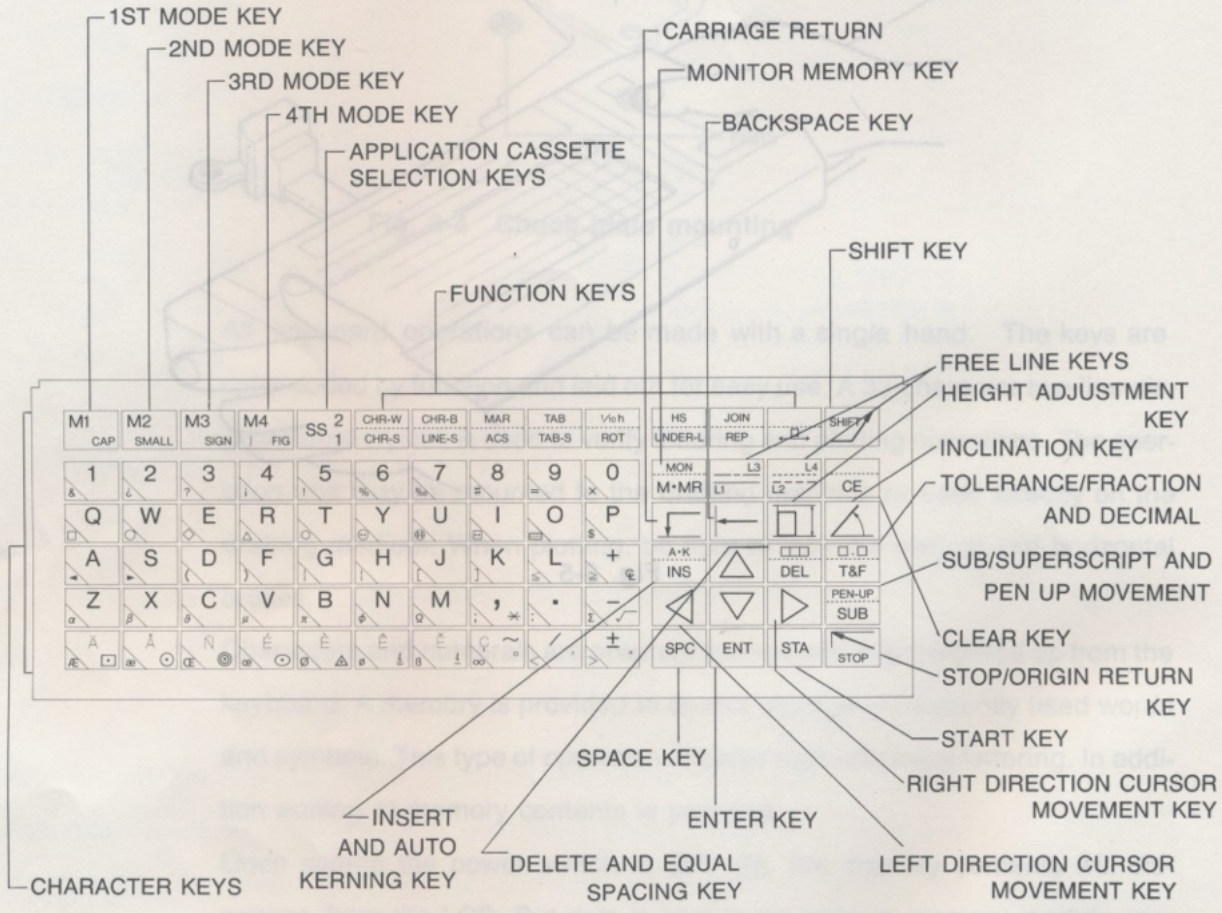


Fig. 3-6 Keyboard arrangement

3.3 Character Types

MUTOH SCRIBER ET1500

Character Sample

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

0123456789

ÄÅÃÁÀÂĂĄČÇĒÉÈÊĔÖÓÒÔŎŠÜÙÛÚŽ

äåãáàâăąčçëéèêĕöóòôšüùûúùûžž

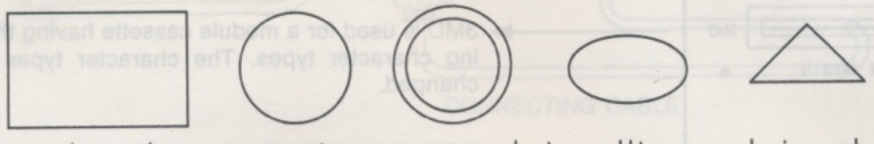
ÆŒæœØøß

ΣΩαβϑμπø

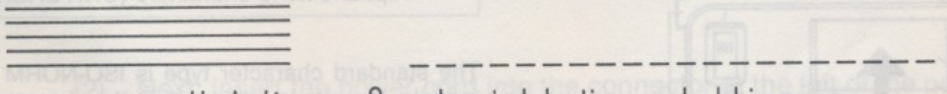
□○◇△⬡{}[]()#*&?¿!¡~/°''',.:;

√ <>≦≧×=+-±¥$%‰∞ØℓL ◄ ►

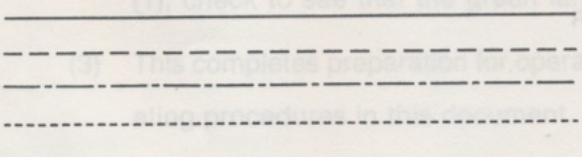
(25) [A1] [MUTOH] (AK 45) (A 01) (enclosed plotting)



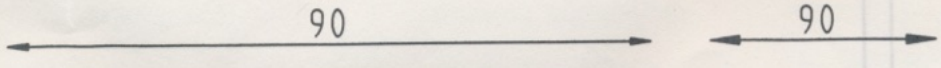
rectangle circle concentric circle ellipse triangle



parallel lines & straight line plotting



4 line types



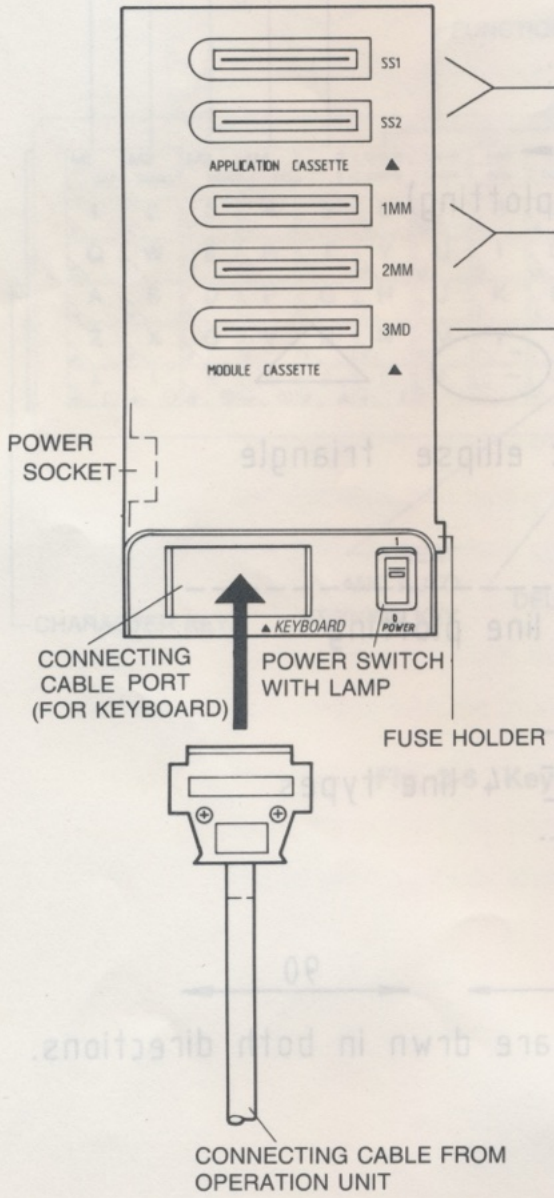
Arrowhead and dimension line are drwn in both directions.

3.4 Power Supply Unit

This unit may be used by inserting optional cassettes containing expansion software into the cassette ports shown below.

A 1A fuse is used. The unit is set up for 90 to 130VAC (50 to 60Hz) or 200 to 260VAC (50 to 60Hz), depending upon the setting of the voltage pin. At time of shipping, the voltage pin is set for 200 to 260V. Therefore, before using at 90 to 130V, the pin setting must be changed.

Custom made cassette is available as an optional item. Consult your sales representatives for prices.



SS1 and SS2 are used for application cassettes for graphics and symbols.

1MM and 2MM are used for a backup memory module cassettes, into which frequently repeated phrased or graphics may be stored.

3MD is used for a module cassette having the following character types. The character types may be changed.

Alphanumeric characters (DIN17/DIN16)
Alphanumeric characters (UNIVERSAL)

The standard character type is ISO-NORM and if a module cassette is not inserted, the character type is ISO 3098.

3.5 Power Supply Connection Method

(1) After setting up to start lettering plug the connecting cable from the operation unit into the connector of the power supply unit marked KEYBOARD.

CAUTION

The power should always be switched to OFF (0) when inserting cables and the power cord.

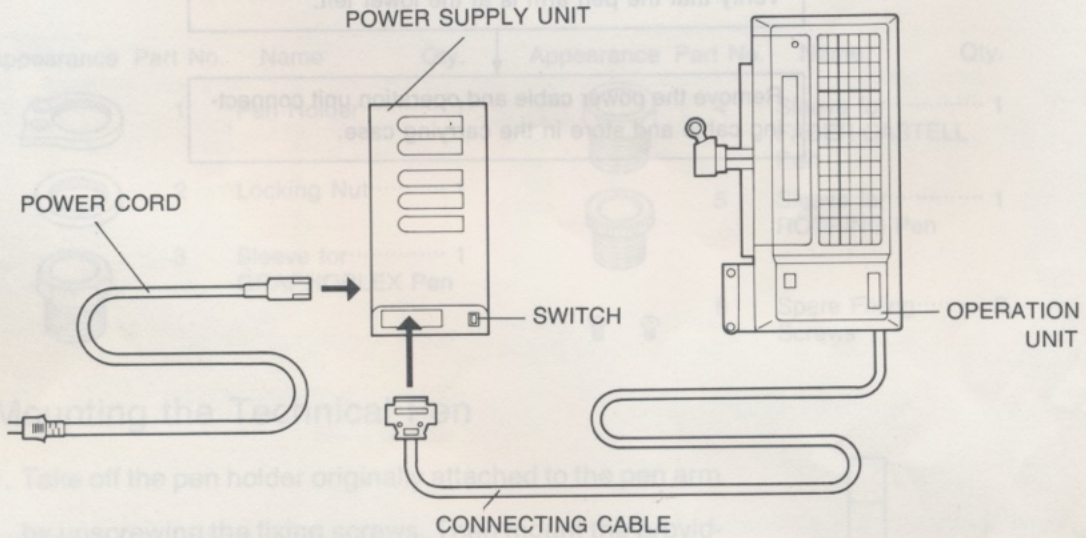
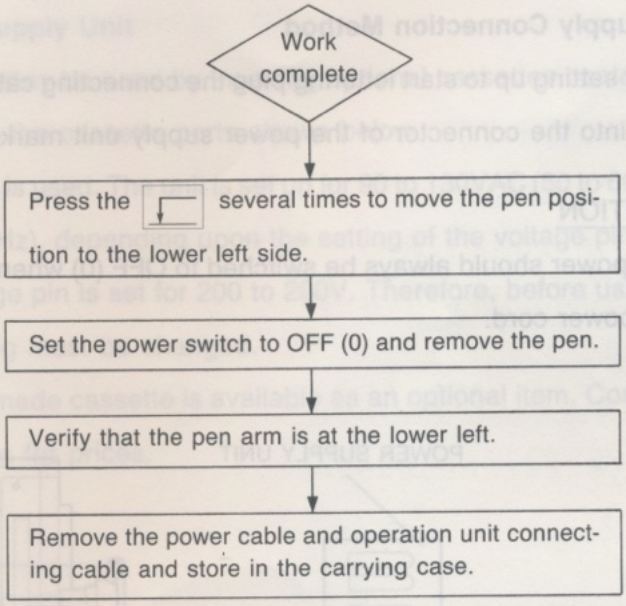


Fig. 3-8 Power connections

(2) Next, insert the power cord into the connector at the left of the power supply unit and the far end into a power outlet. When the power switch is set to ON (1), check to see that the green lamp lights.

(3) This completes preparation for operation. Follow the sections describing operating procedures in this document. After using the ET1500, perform the following procedure.

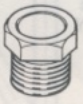

Work complete
Press the several times to move the pen position to the lower left side.
Set the power switch to OFF (0) and remove the pen.
Verify that the pen arm is at the lower left.
Remove the power cable and operation unit connecting cable and store in the carrying case.

Technical Pen Adapter

The pen holder originally attached to the pen arm has been designed to receive ROTRING Variant, Variouscript or Rapidograph pens, and STAEDTLER Marsmatic 700 pen without any adapter.

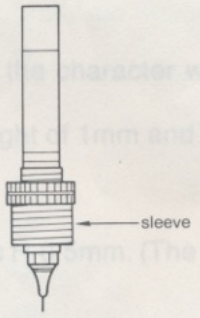
This set of adapters is provided to enable installation of other pens such as GRAPHOPLEX and FABER-CASTELL pens. You can install aforesaid ROTRING pens by this adapter, also.

A set of adapters is comprised of the following parts:

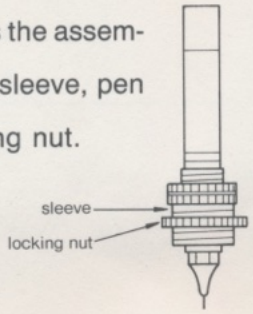
Appearance	Part No.	Name	Qty.
	1	Pen Holder	1
	2	Locking Nut	1
	3	Sleeve for GRAPHOPLEX Pen	1
	4	Sleeve for FABER-CASTELL Pen	1
	5	Sleeve for ROTRING Pen	1
	6	Spare Fixing Screws	2

Mounting the Technical Pen

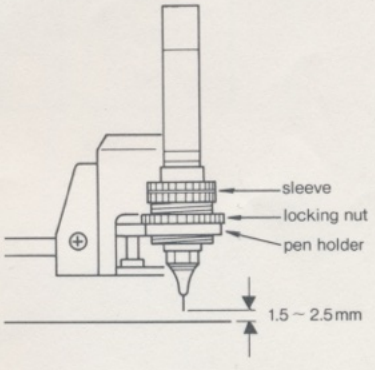
1. Take off the pen holder originally attached to the pen arm by unscrewing the fixing screws. Then mount the provided pen holder (Part No.1) with the fixing screws.
2. Select the sleeve (Part No. 3, 4 or 5) in accordance with your pen and screw the pen (barrel removed) all the way into the sleeve.



3. Screw the locking nut (Part No.2) halfway into the sleeve. This completes the assembly of the sleeve, pen and locking nut.

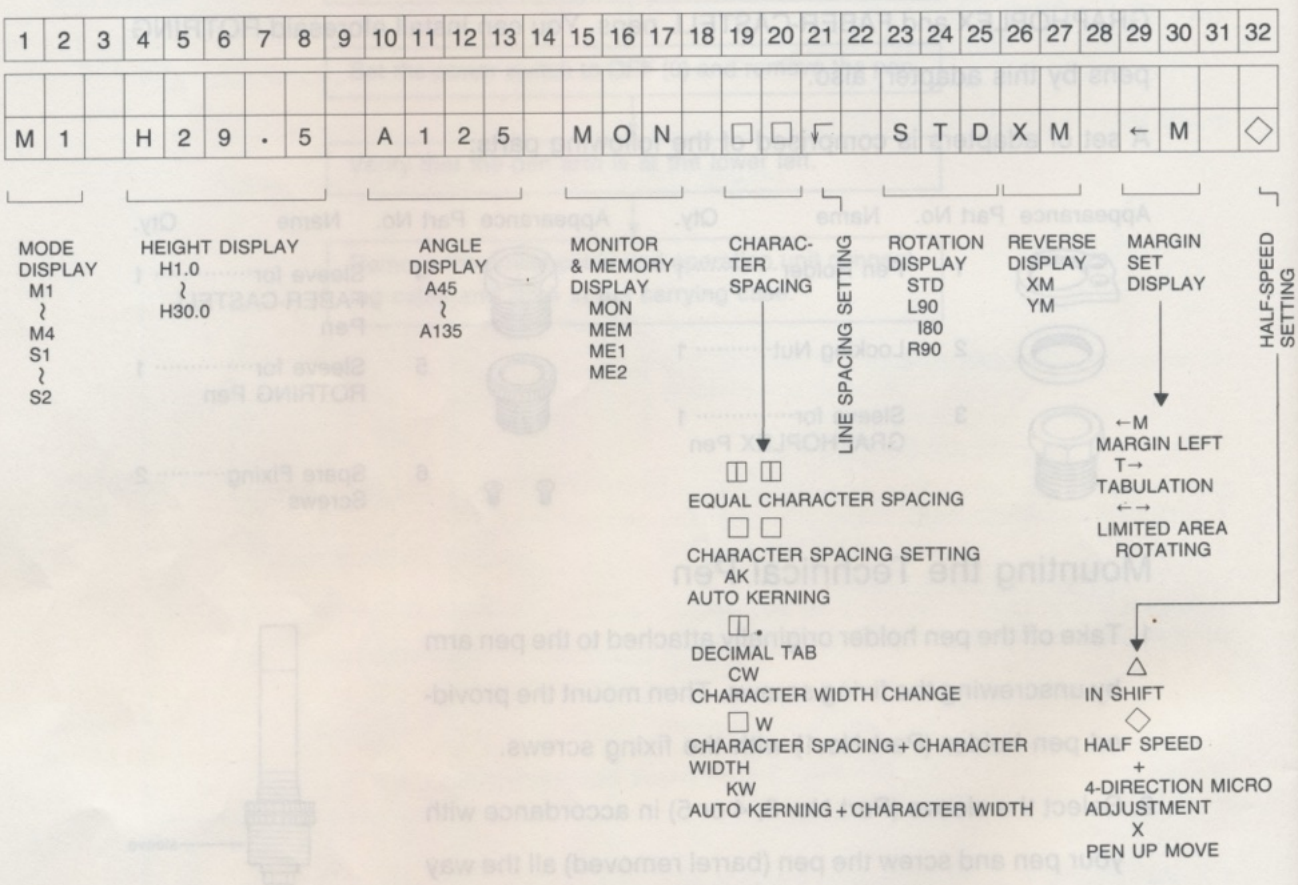


4. Screw the assembled sleeve into the pen holder until the tip of the pen is within 1.5 mm to 2.5mm of the drawing surface. Secure the sleeve in this position by screwing the locking nut firmly.



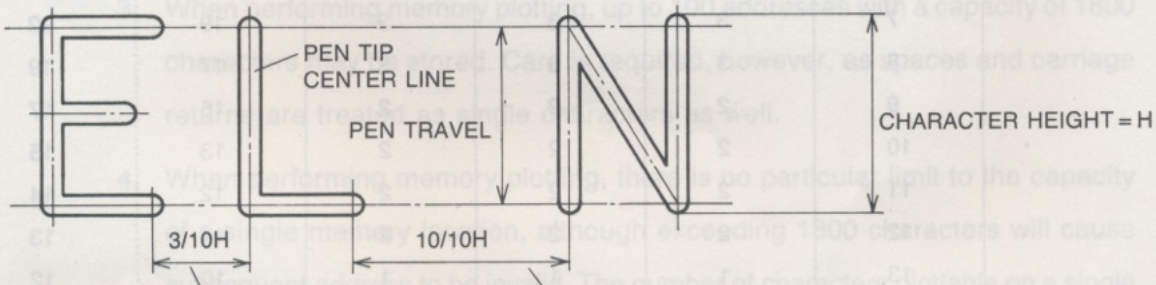
4. OPERATION

- **Display**



4.1 Plotted Font and Dimensions

- The basic model features alphanumeric characters which conform to the ISO 3098/I = ISO Standard.
- Symbols conform to ISO and JIS STANDARDS (with some defined by Mutoh)
- Character and line spacing for the basic model are proportional and conform to ISO standards. Character and line spacing may be set as desired.
- Character height and related dimensions are as shown below.



Basic model character spacing Basic model spacing

- Specifying the character height automatically specifies the character width.
- The amount of pen movement is 9/10H for character height of 1mm and 5mm (with a pen thickness of 1/10H).
- For characters of 5mm and greater, the pen movement is H-0.5mm. (The standard pen thickness is 0.5mm = 0.2in.)

4.2 Character Height, Number of Lines and Number of Characters

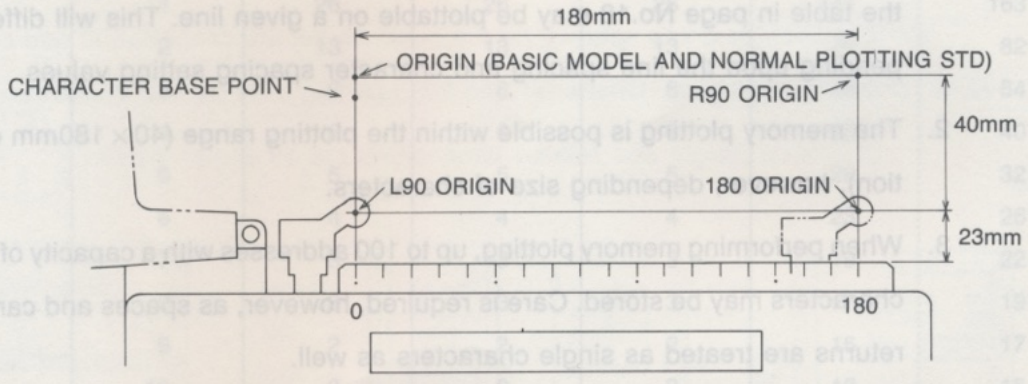
Character height (mm)	Number of lines of characters and symbols	Number of lines of tolerances	Number of lines of fractions	Number of characters storable in memory for 1 line	
				UNIVERSAL DIN-17	1503098
1	26	26	26	141	163
2	13	13	13	70	82
3	8	8	8	46	54
4	6	6	6	35	40
5	5	5	5	28	32
6	4	4	4	23	26
7	3	3	3	19	22
8	3	3	3	17	19
9	2	2	2	15	17
10	2	2	2	13	15
11	2	2	2	12	14
12	2	2	2	11	13
13	1	1	1	10	12
14	1	1	1	9	11
15	1	1	1	9	10
16	1	1	1	8	9
17	1	1	1	7	9
18	1	1	1	7	8
19	1	1	1	7	8
20	1	1	1	6	7
21	1	1	1	6	7
22	1	1	1	6	7
23	1	1	1	5	6
24	1	1	1	5	6
25	1	Unusable	Unusable	5	6
26	1	"	"	5	6
27	1	"	"	5	5
28	1	"	"	4	5
29	1	"	"	4	5
30	1	"	"	4	5

Notes:

1. The number of characters set using the upper-case are automatically adjusted proportionally for the basic mode. Therefore, the character width will depend upon what character is being plotted, so that more characters than listed in the table in page No.18 may be plottable on a given line. This will differ depending upon the line spacing and character spacing setting values.
2. The memory plotting is possible within the plotting range (40 × 180mm direction), however, depending size of characters.
3. When performing memory plotting, up to 100 addresses with a capacity of 1800 characters may be stored. Care is required, however, as spaces and carriage returns are treated as single characters as well.
4. When performing memory plotting, there is no particular limit to the capacity of a single memory location, although exceeding 1800 characters will cause subsequent address to be invalid. The number of characters plottable on a single line will be limited by the character or symbol size, so that when many characters are stored in memory or large characters are plotted, it is necessary to determine beforehand the position at which a new line should be started.
5. When using the backup memory, function contents are stored in the cassettes even with the power switched off. (Permanent)

4.3 Setting of Plotting Conditions

4.3.1 Plotting Area

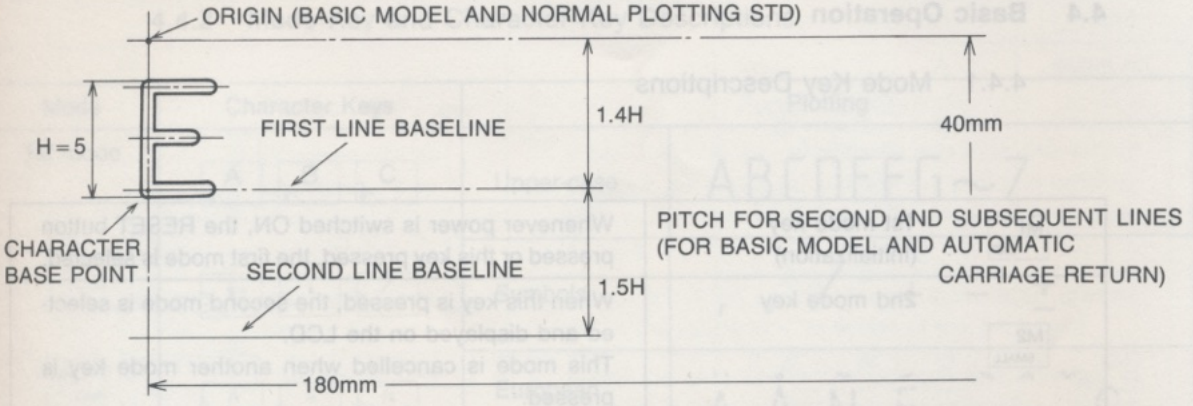


As shown above, the plotting area extends on the horizontal scale from the 0 mark to the 180 mm mark at the right and in the vertical direction from a point approximately 23mm from the scale edge to a point 40mm above this.

4.3.2 Plotting Preparation

Set the power switch to ON (1) referring to the section on power supply connections. The operation unit LCD will indicate "MUTOH SCRIBER ET1500". This display indicates that preparation for plotting is completed (this display also appears whenever the RESET button is pressed).

When preparation for plotting is made, the pen tip position moves to the "character origin", and plotting of the character begins at this point. For example, to plot a "E" with a height of H = 5mm, the following position relationships hold.


ORIGIN (BASIC MODEL AND NORMAL PLOTTING STD)
H = 5
FIRST LINE BASELINE
1.4H
40mm
CHARACTER
BASE POINT
SECOND LINE BASELINE
1.5H
PITCH FOR SECOND AND SUBSEQUENT LINES
(FOR BASIC MODEL AND AUTOMATIC
CARRIAGE RETURN)
180mm

4.4 Basic Operation

4.4.1 Mode Key Descriptions

M1 CAP	1st mode key (initialization)	Whenever power is switched ON, the RESET button pressed or this key pressed, the first mode is selected.
M2 SMALL	2nd mode key	When this key is pressed, the second mode is selected and displayed on the LCD. This mode is cancelled when another mode key is pressed.
M3 SIGN	3rd mode key	When this key is pressed, the third mode is selected and displayed on the LCD. This mode is cancelled when another mode key is pressed.
M4 FIG	4th mode key	When this key is pressed, the fourth mode is selected and displayed on the LCD. This mode is cancelled when another mode key is pressed.
SS 2 1	1st special symbol mode key	When this key is pressed, the mode which recalls No.1 (SS1) from the application cassette is selected and displayed on the LCD. Pressing the key once again cancels this mode.
	2nd special symbol mode key	When the shift key and then this key are pressed, the mode which recalls No.2 (SS2) from the application cassette is selected and displayed on the LCD. pressing the keys once again cancels this mode.

- The last key of mode keys M1 through M4 has precedence and the previous mode will be cancelled. After cancelling SS1 and SS2, return is made to the M1 through M4 mode in effect before the SS mode was selected.

4.4.2 Mode Key and Character Key Descriptions

Mode	Character Keys	Plotting	
1st mode M1 CAP	A B C	Upper-case	ABCDEFG~Z
	, . /	Symbols	, . / + − ±
	Ä Å Ñ	European accents	Ä Å Ñ É ˜ ^ ˇ Ç (for upper-case)
	1 2 3	Numerals	12345~0
2nd mode M2 SMALL	A B C	Lower-case	abcdef~z
	, . /	Symbols	, . / + − ± ~
	Ä Å Ñ	European accents	ä å ñ é ˜ ^ ˇ (for lower-case) (Note: M1 used for Ç)
	1 2 3	Numerals	12345~0
	SHIFT A	Upper-case	A M1 mode enabled for 1 character only after shift is pressed.
3rd mode M3 SIGN	− Z X C V B N M	Greek letters	Σ α β ϑ μ π Φ Ω
	Ä Å Ñ	European	Æ æ Œ œ Ø ø ß

Mode	Character Keys	Plotting	
1st mode M3 SIGN	A S D F G / ± L 1 3 5 Q W E R T Y U I O	Symbols	<> ≤ ≥ &¿?¡!%‰#=×$;:∞
		Encircling	1 A MUTOH
4th mode		Symbols	° ′ ″ ✳ √
M4 FIG		Graphics	Plots a rectangle. Plots a circle. Plots concentric circles. Plots an ellipse. Plots a triangle. Plots parallel lines. Plots straight line.
	A B C 1 2 3	Upper-case	ABCD~Z (26 alphabet numbers only)
		Numerals	1234~0

4.4.3 Function Key Descriptions

	Function key	Function Description
CHR-W / CHR-S	Character Width Conversion Key	When the shift key is pressed and then this key is pressed, the character width of the standard lettering style can be converted from 50% up to 140% in units of 10%.
	Character Spacing Setting Key	Pressing this key enables the character spacing to be set in the range W= to 9/10H of the set height.
CHR-B / LINE-S	Character-string Moving Key	When the shift key is pressed and then this key is pressed, the character-string in line units can be moved to the center and also to the left and right margins.
	Line Spacing Setting Key	Pressing this key enables the line spacing to be set in units of 0.1mm as desired without regard to the character height setting.
MAR / ACS	Margin Left Key	When the shift key is pressed and then this key is pressed, the margin left can be changed as desired in character height setting space units.
	Limited Area Key	Pressing this key enables automatic adjustment of the character space and plotting within the limited area (automatic character spacing adjustment function).
TAB / TAB-S	Tab Setting Key	Pressing the shift key and then this key enables up to 10 tabs to be set in units of character height spacing.
	Tab Space Key	Pressing this key moves to the next set tab position. If a tab was not set, a beeper sounds.
⅓h / ROT	Pen Arm Fine Adjustment Key	When the shift key is pressed and then this key is pressed, the pen can move up and down and also to the left and right in units of 1/10H of the set height.
	Reversion/Rotation Plotting Key	Pressing this key rotates the plotting direction and enables characters to be reversed (inverted) in 90° units. The same applies to the application symbol.
HS / UNDER-L	Half-speed Key	Pressing the shift key and then this key enables reduction in the plotting speed to about 1/3. For a release, press the shift key and then this key.
	Underline Key	Pressing this key plots a segment of a line 1mm underneath a baseline of the character or the character-string.
JOIN / REP	Joint Key	Pressing the shift key and then this key plots same application (graphic type) symbols in the X direction in plural number (such symbols as coils and resistors).
	Repeat Key	Pressing this key plots several same application (graphic type) symbols in X or Y direction spaced at set interval.

	Function key	Function Description
	Automatic Dimension Plotting Key	Pressing this key automatically and simultaneously plots dimension values or characters and symbols and dimension lines.
	Shift Key	Used at time of shifting the function. If the shift key is pressed in the M2 (small letter in English), only one capital letter of M1 can be plotted. When this key is pressed, "△" will be indicated on the bottom right end and will be held there until a next key is pressed.
	Monitor Key	When the shift key is pressed and then this key is pressed, the plotted contents can be indicated on the display and then plotting can be performed. It is also possible to edit (insert, delete and correct) the contents on the display.
	Memory Key	If a character-string to be plotted repeatedly is stored in memory, this key is used to recall the memory contents and plot the contents at any desired number of times. Editing of the memory contents is also possible. In case of the basic model, the memory contents will disappear the moment the power is turned OFF (0), but if the memory cassette (MM1) is used, the contents can be held.
	Free Single Dot-dash Line	Pressing the shift key and then this key plots a single dot-dash line (L3).
	Free Solid Line	While this key is pressed, a continuous solid line can be plotted (L1)
	Free Dotted Line	Pressing the shift key and then this key plots a dotted line (L4).
	Free Broken Line	While this key is pressed, a broken line is plotted (L2)
	Clear Key	Pressing this key clears all of the upper portion of the display.
	Carriage Return Key	Pressing this key moves the pen to the starting position of the next line.
	Backspace Key	When this key is pressed, the pen moves back 32 characters in units of one character and after the 33rd pressing, the pen moves back for the set space. For monitor/memory plotting it moves the pen to the starting position.
	Height Conversion Key	This key enables the setting of character height in the range 1 to 30mm in 0.1mm units (settable up to 40mm for application cassette character only).
	Character Inclination Key	Pressing this key enables the Y axis of characters and symbols to be set in the range 45 to 135° (±45°) with a setting resolution of 1°.

	Function key	Function Description
	Automatic Dimension Plotting Key	Pressing this key automatically and simultaneously plots dimension values or characters and symbols and dimension lines.
	Shift Key	Used at time of shifting the function. If the shift key is pressed in the M2 (small letter in English), only one capital letter of M1 can be plotted. When this key is pressed, "△" will be indicated on the bottom right end and will be held there until a next key is pressed.
	Monitor Key	When the shift key is pressed and then this key is pressed, the plotted contents can be indicated on the display and then plotting can be performed. It is also possible to edit (insert, delete and correct) the contents on the display.
	Memory Key	If a character-string to be plotted repeatedly is stored in memory, this key is used to recall the memory contents and plot the contents at any desired number of times. Editing of the memory contents is also possible. In case of the basic model, the memory contents will disappear the moment the power is turned OFF (0), but if the memory cassette (MM1) is used, the contents can be held.
	Free Single Dot-dash Line	Pressing the shift key and then this key plots a single dot-dash line (L3).
	Free Solid Line	While this key is pressed, a continuous solid line can be plotted (L1)
	Free Dotted Line	Pressing the shift key and then this key plots a dotted line (L4).
	Free Broken Line	While this key is pressed, a broken line is plotted (L2)
	Clear Key	Pressing this key clears all of the upper portion of the display.
	Carriage Return Key	Pressing this key moves the pen to the starting position of the next line.
	Backspace Key	When this key is pressed, the pen moves back 32 characters in units of one character and after the 33rd pressing, the pen moves back for the set space. For monitor/memory plotting it moves the pen to the starting position.
	Height Conversion Key	This key enables the setting of character height in the range 1 to 30mm in 0.1mm units (settable up to 40mm for application cassette character only).
	Character Inclination Key	Pressing this key enables the Y axis of characters and symbols to be set in the range 45 to 135° (±45°) with a setting resolution of 1°.

	Function key	Function Description
A·K INS	Auto Kerning Key	When the shift key is pressed and then this key is pressed, the characters can be plotted so that the spaces between the neighboring characters become uniform. This function, however, is limited only to the alphabetical capital letters and small leters.
	Insert Key	For monitor and memory plotting, this key is used to insert a character space into the character-string indicated on the display.
□□□ DEL	Equal Spacing Key	Pressing the shift key and then this key enables even spacing of the alphabet, numerals and symbols.
	Delete Key	For monitor and memory plotting, this key is used to delete the characters in the display.
□.□ T&F	Decimal Tab Key	Pressing the shift key and then this key enables division of figures with the decimal points in the center toward the direction of carriage return (vertical). However, the function will set the character width of the decimal point to 4/10H and the characters before and after the decimal point will be set with equal spaces.
	Tolerance and Fraction Key	Pressing this key plots tolerances and fractions.
PEN-UP SUB	Pen Up Move Key	When the shift key is pressed and then this key is pressed, the pen moves up so one can find the position of the characters or the character-string.
	Subscript/ Superscript	Pressing this key plots subscripts and superscripts.
△	Pen Arm Fine Adjustment Key	Pressing this key after a fine adjustment moves the pen upward and downward in 1/10H units of the set height.
▽	Cursor Movement Key	These keys are used to move the cursor to the left and right for monitor and memory plotting to enable editing of the displayed character contents (insertion, deletion and correction).
◁	Pen Arm Fine Adjustment Key	Pressing this key after a fine adjustment moves the pen upward and downward in 1/10 units of the set height.
▷	Cursor Movement Key	These keys are used to move the cursor to the left and right for monitor and memory plotting to enable editing of the displayed character contents (insertion, deletion and correction).
SPC	Space Key	Pressing this key moves the pen by an amount W = 7/10H (H is a set height) (when the space and character are not set in the basic model.)

	Function key	Function Description
ENT	Enter	This key is used to indicate the end of memory content input and is used to set plotting conditions. It is also used for monitor plotting as the input completion and plotting start key.
STA	Start	This key is used to start plotting of monitor and memory contents.
STOP	Stop	This key is used to start plotting of monitor and memory contents.
RESET button		Causes initialization (red button located on the right side of the operation unit).

4.4.4 Alarm Beeper and Error Display

- A beeper will sound at 30mm before the end of the plotting area and beep again if the set plotting conditions (character height, pen position) exceed the plotting area, and "OUT OF AREA" will appear on the LCD, indicating that the plotting area has been exceeded.
- The beeper will also sound if an improper key sequence is used, at which point "KEY IN ERROR" will appear in the LCD display indicating an input error.

4.4.5 Setting of Plotting Conditions

(a) Character Height Setting

- The character height may be set in the range 1mm to 30mm in 0.1mm steps. This setting may be used in any mode (including characters and symbols).
- The character size conforms to ISO standards. For characters of up to but not including 5mm, the pen line thickness is assumed to be 1/10H. The pen is moved, therefore, 9/10H.

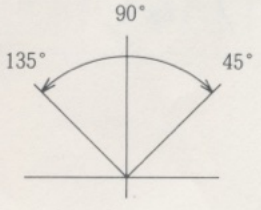
  For characters of 5mm or greater, the pen movement is H-0.5mm (pen set to 0.5mm).
- In the initialized condition (whenever power is first switched on or whenever the RESET button is pressed), the character height is set to 3.5mm.

(b) Changing the Character Height

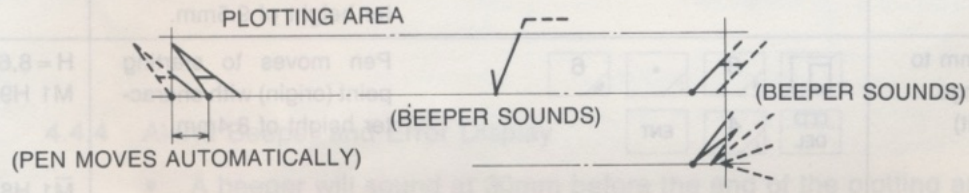
Setting	Key operation		Display (Upper / Lower)
Set height to 5mm	5 ENT	Pen moves to starting point (origin) with character height 5mm.	H=5_ M1 H3.5 A90 M1 H5.0 A90
Set height to 9.5mm	9 • 5 ENT	Pen moves to starting point (origin) with character height of 9.5mm.	M1 H9.5 A90
Change 8.6mm to 8.4mm (change only last digit)	8 • 6 DEL 4 ENT	Pen moves to starting point (origin) with character height of 8.4mm.	H=8.6_ M1 H9.5 A90 M1 H8.4 A90
Input 35mm. 1 Plotting area exceeded	3 5 ENT	Exceeding the plotting area causes a beeper to sound as a warning. New setting made.	M1 H35.0 A90
2 Input 16.5mm	1 6 • 5		H=16.5_ M1 H3.5 A90
3 Change 16.5mm to 18mm	DEL DEL DEL	Cursor moves.	
Ex.1	8 ENT	Input new value.	
Ex. 2	CE 1 8 ENT	Clear and make new input. Pen moves to 18mm origin.	H=18_ M1 H3.5 A90

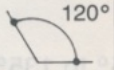
(c) Changing the Character Inclination (Default 90°)

- The inclination of characters can be set in the range of 45° to 135° with respect to Y-axis with a setting resolution of 1°.



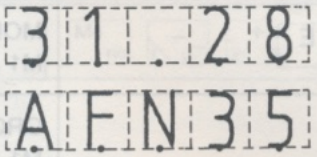
- The pen automatically moves to the right if the character at far left end (starting point) exceeds the plotting area when the angles in the range of 91° to 135° are set. If the character at far right end exceeds the plotting area when the angles in the range of 45° to 89° are set, a beeper will sound as a warning.

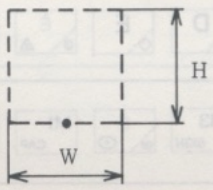


Setting	Key operation		Display (Upper / Lower)
Plot 123 with an inclination of 75°	[∠] [7] [5] [ENT] / [1] [2] [3]	Set the angle.	A=75 M1 H3.5̄ A90 123 M1 H̄3.5 A75
Plot 123 with an inclination of 120° 	[∠] [1] [2] [0] [ENT] / [1] [2] [3]	Set the angle.	A=120_ M1 H3.5 A90 123 M1 H̄3.5 A120

(d) Equal Digit Spacing

- This function enables plotting alphabet, numerals and symbols in a grid pattern of equal spacings, e.g., in columns.
- The character origin (i.e., pen stopping position) in equal space plotting is at the center of the bottom of the characters.





H = Character height
W = 1H

The mark • indicates the character origin for equally spaced characters.

Plotting Example	Key Operation	Upper Display Lower
Equal Interval Plotting 11.2	SHIFT DEL 1 1 • 2 Standard 11.2 11.2	11.2 M1 H3.5 A90***

4.4.6 General Plotting Method (Direct Plotting)

(a) Upper-Case Characters

Plotting Example	Key Operation	Upper Display Lower
ABCD	A B C D (Initial condition M1)	ABCD_ M1 H3.5 A90
MODÈLE	M O D E È L E	MODE ` LE_ M1 H3.5 A90
GRØN	G R M3 SIGN É M1 CAP N	GRØN_ M1 H3.5 A90

(b) Lower-Case Characters

Plotting Example	Key Operation	Upper Display Lower
abcd	M2 SMALL A B C D	abcd_ M2 H3.5 A90
français	M2 SMALL F R A N C SHIFT ç ~ A I S M1 usable also. For M1, continue after returning to M2.	franc,ais_ M2 H3.5 A90
grün	M2 SMALL G R U Ä N	gru¨n_ M2 H3.5 A

(c) Numerals (Usable in 1st, 2nd and 4th modes)

Plotting Example	Key Operation	Upper Display Lower
01234	0 1 2 3 4	01234_ M1 H3.5 A90

(d) Symbols

Plotting Example	Key Operation	Display Upper Lower
() {} [ ]	M3 SIGN D F G H J K	( ) { } [ ] _ M3 H3.5 A90
% $	M3 SIGN 6 P	% $ _ M3 H3.5 A90
√ ℄	M4 FIG − +	√ ℄ _ M4 H3.5 A90

(e) Tolerances and Fractions

- In direct plotting, return plotting is not possible. Return plotting should be performed by using monitor or memory plotting.
- When performing direct plotting, the tolerance and fraction plotting functions are started using the enter key and simultaneously cancelled.
- When plotting tolerances and fractions, there is a limitation to the plottable character height. (Ref. page 18)

Plotting Example	Key Operation	Display Upper Lower
$50^{0}_{-0.2}$	5 0 □.□ T&F SPC 0 ⌐ − 0 . 2 ENT Enter a space key to align digits if a plus or minus sign if not to be added before a tolerance. 2nd part of 1st input is the top of the tolerance.	␣ indicates a space. 50␣0∓ −0.2 _ M1 H3.5 A90
$50^{+0.2}_{0}$	5 0 □.□ T&F + 0 . 2 ⌐ SPC 0 ENT	50 + 0.2∓␣0 _ M1 H3.5 A90

Plotting Example	Key Operation	Display (Upper / Lower)
$50^{+0.2}_{-0.1}$	5 0 T&F + 0 . 2 ENT − 0 . 1	50+0.2F−0.1_ M1 H3.5 A90
$50^{+0.05}_{+0.01}$	5 0 T&F + 0 . 0 5 ENT + 0 . 0 1	50+0.05F+0.01_ M1 H3.5 A90
50 ± 0.3	5 0 T&F ± 0 . 3 ENT	50±0.3_ M1 H3.5 A90
$50^{10.01}_{28.89}$	5 0 T&F 1 0 . 0 1 ENT 2 8 . 8 9 ENT	50 10.01F28.89_ M1 H3.5 A90
H_2O	H T&F 2 ENT O	HF20_ M1 H3.5 A90
$1/5$	T&F 1 / 5 ENT	1/5_ M1 H3.5 A90
kg/m^2	M2 SMALL T&F K G / M ENT PEN-UP SUB SPC 2 ENT ENT 1st enter cancels exponent. 2nd enter cancels fraction.	kg/m□2_ M2 H3.5 A90
X_2/Y_2	T&F X PEN-UP SUB 2 ENT / Y PEN-UP SUB 2 ENT ENT	X□2/Y□2_ M1 H3.5 A90

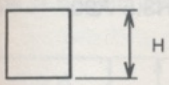
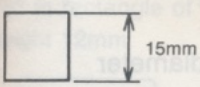
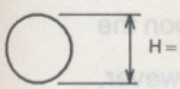
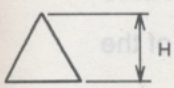
(f) Subscripts and Superscripts

- In direct plotting, return plotting is not possible. Return plotting should be performed by using monitor or memory functions.
- In direct plotting, pressing the Enter key initiates plotting of subscripts and superscripts, and at the same time cancels their functions.

Plotting Example	Key Operation		Upper Display Lower
A_1	A → PEN-UP SUB 1 & ENT	Enter immediately for subscript.	A □ 1_ M1 H3.5 A90
m^3	M2 SMALL M @ PEN-UP SUB SPC 3 ? ENT	Preface with a space for exponent.	m □ ␣ 3_ M2 H3.5 A90

(g) Plotting Symbols

- For symbols such as squares, circles and triangles, symbols are plotted. For other types, graphics may also be used as required for individual applications.

Plotting Example	Key Operation		Upper Display Lower
Plot square 	M3 SIGN Q □	The height of the square is the set character height (3.5mm when power is first switched ON)	□ _ M3 H3.5 A90
Plot square of height 15mm 	* Specify height. 1 & 5 ! ENT M3 SIGN Q □		□ _ M3 H15.0 A90
Plot circle 	M3 SIGN W @	The circle's diameter is the set character height.	○ _ M3 H15.0 A90
Plot triangle 	M3 SIGN R △		△ _ M3 H15.0 A90

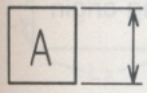
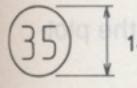
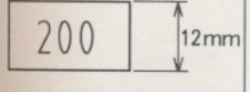
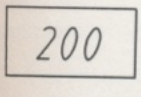
(h) Plotting Arrows

- When the arrow (left and right) key is pressed, a buzzer will sound if the plotting area has been exceeded. If this occurs, use the space key or backspace key to correct the position to within the plotting area.

Plotting Example	Key Operation	Display Upper / Lower
Plot arrows	M3 SIGN, SPC, SPC, S M3 SIGN, A	␣␣→— M3 H3.5 A90 ←— M3 H3.5 A90
Plot arrows connected by dotted line	M3 SIGN, A, SHIFT, L4/L2, S	←→— M3 H3.5 A90
Plot arrows connected by broken line	M3 SIGN, A, SHIFT, L3/L1	←— M3 H3.5 A90

(i) Plotting Enclosures

- The height of the enclosing square or rectangle is specified (diameter for a circle)
- The aspect ratio (height: horizontal) of the rectangle is 1:2.
- The character height will change automatically, depending upon the number of characters to be plotted within the enclosure. However, plotting will not be possible for a character height of 1mm or less (the beeper will sound and plotting will not be made). In such cases, reduce the number of characters or increase the height (or diameter) of the enclosure.
- In direct plotting, return plotting is not possible. Return plotting should be performed by using monitor or memory plotting.
- When performing direct plotting, the enclosure plotting function is started using the enter key and simultaneously cancelled.

Plotting Example	Key Operation	Display Upper Lower
Plot A in square of height 10mm 	[□] [1] [0] [ENT] [M3 SIGN] [I] Specify type and height of enclosure. [M1 CAP] [A] Specify plotted characters (align). [ENT] Start plotting.	enclose □_ M1 H10.0 A90 enclose □ A_ M1 H10.0 A90
Plot 35 in circle of diameter 14mm 	[□] [1] [4] [ENT] [M3 SIGN] [Y] Specify type and height of enclosure. [M1 CAP] [3] [5] Specify plotted characters (align). [ENT] Start plotting.	enclose ○_ M3 H14.0 A90 enclose ○ 35_ M3 H14.0 A90
Plot A/01 in 2-level circle of diameter 20mm 	[□] [2] [0] [ENT] [M3 SIGN] [U] [M1 CAP] [A] [0] [1] [ENT]	enclose 2 ○_ M3 H20.0 A90 enclose 2 ○ A⊣01_ M1 H20.0 A90
Plot 200 in rectangle of height 12mm 	[□] [1] [2] [ENT] [M3 SIGN] [O] [M1 CAP] [2] [0] [0] [ENT]	enclose rec_ M3 H12.0 A90 enclose rec 200_ M1 H12.0 A90
Plot 200 inclined at 75° in rectangle of height 12mm 	[□] [1] [2] [ENT] [∠] [7] [5] [ENT] [M3 SIGN] [O] [M1 CAP] [2] [0] [0] [ENT] (Note the rectangle is not inclined).	A=75_ M1 H12.0 A90 enclose rec 200_ M1 H12.0 A75

4.4.7 Graphics Plotting Method

- In direct plotting, return plotting is not possible. Return plotting should be performed by using monitor or memory plotting.
- For direct plotting, the enter key moves the pen to the plotting origin and the start key starts plotting.
- For memory or monitor function, the start key moves the pen to the plotting origin and pressing once more start plotting.
- The graphics plotting function is cancelled simultaneous with the plotting (for direct plotting.

(a) Rectangle Plotting.

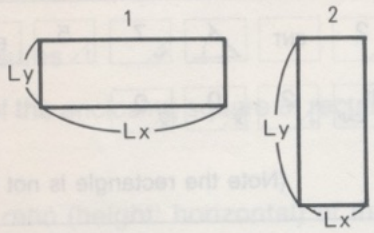
○ Plotting Conditions

(1) Standard rectangle

(2) Rotated rectangle (L90, 180, R90)

(3) Memory plotting

* For graphics plotting, interactive dialogue is used and monitor plotting is selected automatically.



○ Plotting Area (0.1mm units)

(1) Standard/180° rectangles:

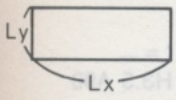
0.1mm ≦ Lx ≦ 180mm

0.1mm ≦ Ly ≦ 40mm

(2) L90/R90 rectangles

0.1mm ≦ Lx ≦ 40mm

0.1mm ≦ Ly ≦ 180mm

Plotting Example	Key Operation	Upper Display / Lower
 Lx = 120.5mm Ly = 35mm	MON / M•MR — For the 000 address memory plotting (one graphic only at each address) (If storage is not Required.) M4 FIG 1 2 0 • 5 ENT 3 5 ENT ENT ← Memory STA STA ← Plot starts Pen moves to origin or rectangle	REC 1x = _ M4 H3.5 A90 REC 1x = 120.5 1y = _ M4 H3.5 A90 REC 1x = 120.5 1y × 35_ M4 H3.5 A90

(b) Circle Plotting

○ Plotting Conditions

(1) Standard circle plotting

(2) Rotated circle (L90, 180, R90)

(3) Memory plotting

○ Setting Ranges (same for concentric circles)

0.1mm ≦ r ≦ 20mm (in 0.1mm units)

Plotting Example	Key Operation	Display (Upper / Lower)
Plot circle of r = 12mm	MON M·MR ◁ 1 ▷ — For the 001 address memory plotting.	
	M4 FIG — Pen moves to origin of circle (center)	cir r = _ M4 H3.5 A90
	1 2 ENT ENT STA STA ← Memory	cir r = 12 _ M4 H3.5 A90

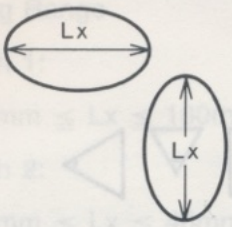
(c) Concentric Circle Plotting (10:8 ratio between outer and inner circle)

- Plotting conditions are the same as described in (b) for circles (diameter is for outer circle)

Plotting Example	Key Operation	Display (Upper / Lower)
Plot concentric circles with outer circle having radius r = 10mm	MON M·MR ◁ 2 ▷ — For the 002 address memory plotting.	
	M4 FIG — Pen moves to origin of circle (center)	concen r = _ M4 H3.5 A90
	1 0 ENT ENT STA STA ← Memory	concen r = 10 _ M4 H3.5 A90

(d) Ellipse Plotting

- Plotting Conditions
  - (1) Standard plotting
  - (2) Rotated plotting (L90, 180, R90)
  - (3) Memory plotting



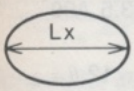
○ Setting Range

Major axis:

0.1mm ≦ Lx ≦ 40mm (0.1mm units)

Angle:

$\theta = 5° \sim 75°$ (1° steps)

Plotting Example	Key Operation	Display Upper / Lower
 Plot 35° ellipse with major aixs of 16mm	MON M·MR, ◁, 3, ▷ For 003 address memory plotting.	
	M4 FIG, É œ ⊙	ellipse θ=_ M¡ H3.5 A90
	3, 5, ENT Pen moves to origin of ellipse (center)	ellipse θ=35 1x=_ M4 H3.5 A90
	1 &, 6 %, ENT, ENT	ellipse θ=35 1x=16_ M4 H3.5 A90
	STA, STA ← Memory	

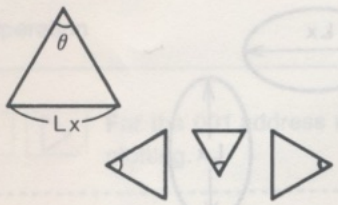
(e) Triangle Plotting

○ Plotting Conditions

(1) Standard plotting

(2) Rotated plotting (L90, 180, R90)

(3) Memory plotting



○ Setting Range

Base:

1.00mm ≦ Lx ≦ 40mm (0.1mm steps)

Angle:

$\theta = 15° \sim 120°$ (1° steps)

Plotting Example	Key Operation	Display (Upper / Lower)
Origin Plotting triangle with Lx = 12mm θ = 60°	MON M·MR ◁ 5 ▷ For the 005 address memory plotting. M4 FIG Pen moves to origin of triangle. 1 2 ENT 6 0 ENT ENT STA STA ← Memory	tri 1x = _ M4 H3.5 A90 tri 1x = 12 θ = _ M4 H3.5 A90 tri 1x = 12 θ = 60 _ M4 H3.5 A90

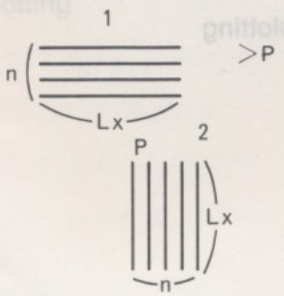
(f) Parallel Line Plotting

○ Plotting Conditions

(1) Standard plotting

(2) Rotated plotting (L90, 180, R90)

(3) Memory plotting



○ Setting Range

Length 1:

0.1mm ≦ Lx ≦ 180mm (0.1mm steps)

Length 2:

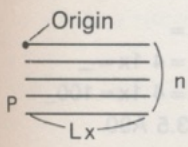
0.1mm ≦ Lx ≦ 40mm (0.1mm steps)

Spacing:

0.1mm ≦ Pitch (0.1mm spacing)

No. of lines:

2≦ n (1 line units)

Plotting Example	Key Operation	Display (Upper / Lower)
 Plot parallel lines (solid) with Lx=80mm P=7mm n=5 lines (L1)	MON M·MR ◁ 5 ▷ Memory plotting (address is 005) M4 FIG L3 L1 4 types of lines are possible. 8 0 ENT Example: Shift + L3 L1 makes dash-dot line. 7 ENT 5 ENT ENT Line type specification STA STA Memory Pen moves to origin	par L=_ par L=11x= par L=11x=80P=_ par L=11x=80P=7 n=_ par l=1 1x=80 P=7 n=5_ M4 H3.5 A90

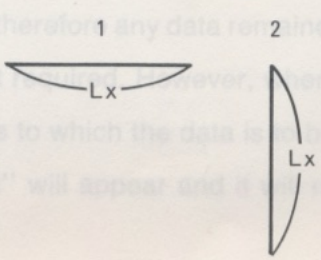
(g) Straight line plotting

○ Plotting conditions

(1) Standard plotting

(2) Rotated plotting (R90, 180, R90)

(3) Memory plotting



○ Setting Conditions

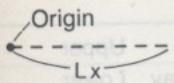
Length 1:

0.1mm ≦ Lx ≦ 180mm (0.1mm units)

Length 2:

0.1mm ≦ Lx ≦ 40mm (0.1mm units)

(4 types possible: Solid, broken, dot and dot-dash.)

Plotting Example	Key Operation	Display Upper / Lower
	MON M·MR ◁ ◁ 2 1 ▷	Memory plotting This is the example of memory address 21.
Plot a dotted line with Lx = 100mm (Dotted line = L4)	M4 FIG ; SHIFT ; L4 ; 1 0 0 ENT ENT ; STA STA ← Memory	Pen moves to origin line L = line L = 4 1x = _ line L = 4 1x = 100_ M4 H3.5 A90

4.4.8 Memory Plotting and Editing

- Memory addresses in the range 000 through 999 (1,000 addresses) may be used.
- The capacity per address is not limited. (But when the backup memory cassette is used, it will be limited to 1800 characters per one address.) Therefore, when storing long phrases and strings of symbols in memory, if the total number of characters exceeds 7000, addresses will remain but are not usable. (For example, if each address is used to store 50 characters, only addresses 000 through 140 will be usable. Similarly, with 1000 characters at each address, only addresses 000 through 007 will be usable.)
- The memory address display appears at the upper left of the liquid crystal display. When the [MON / M·MR] is pressed, "000:" appears.
- When a desired address with a long stored text is recalled, up to 28 characters starting at the beginning of the contents are displayed. The 29th character and beyond may be scrolled to one character at a time. (For continuous scrolling, press the key continuously.)
- Pressing the left and right moving key ([◁] [▷]) of the cursor enables the change of address and pressing the up and down moving key ([◁] [▷]) of the cursor will scroll the set line for the change of address, as well.
- All such editing operations as insertion, deletion and correction will be completed the moment the [ENT] key is pressed.
- At time of input and editing, the position of cursor toward the character-string (X-direction) will be indicated on the counter at the lower part of LCD until pressing of [ENT] key that determines the contents.
- It is possible to copy any data stored at an address to another address and therefore any data remained in the former address may be deleted if not required. However, when the data are already stored in the address to which the data is to be copied, an indication of "KEY IN ERROR" will appear and it will return to the original address.

- The setting conditions for such characters as reversed or rotated characters are not stored. Therefore, they should be stored in memory in the standard mode (STD) and will be plotted in the actual plotting stage after the reversal direction commands are given. (This also applies to character height and inclination.)
- The number of characters plottable per line and the number of lines will depend upon the setting of the character height. For furtheer details, please refer to the table on character height and number of lines and characters in section 4.2.
- In the memory function, memory contents enable to copy to another address. Therefore, if you don't need former memory contents please delete them (original). But, when the memory contents are stored already in the address which you want to copy, the alarm beeper will cry and indicate "KEY IN ERROR" in the LCD.

- When the MON / M•MR key is pressed, description of the remaining memory and the used addresses will be indicated on the upper part of the LCD for approximately 5 seconds.

  1526 CHARACTER FREE LAST NO.12

  In this case, 1526 of the 1800 characters storable in memory have still been unused and addresses up to address 012 have been assigned. Thus, when new storage is to be performed into memory, this should be made starting at address 013. (Caution: Even if some of the address before the last address number indicated in this display have been left unused — for example address No.009 and 010, the last (highest) address used will appear.)

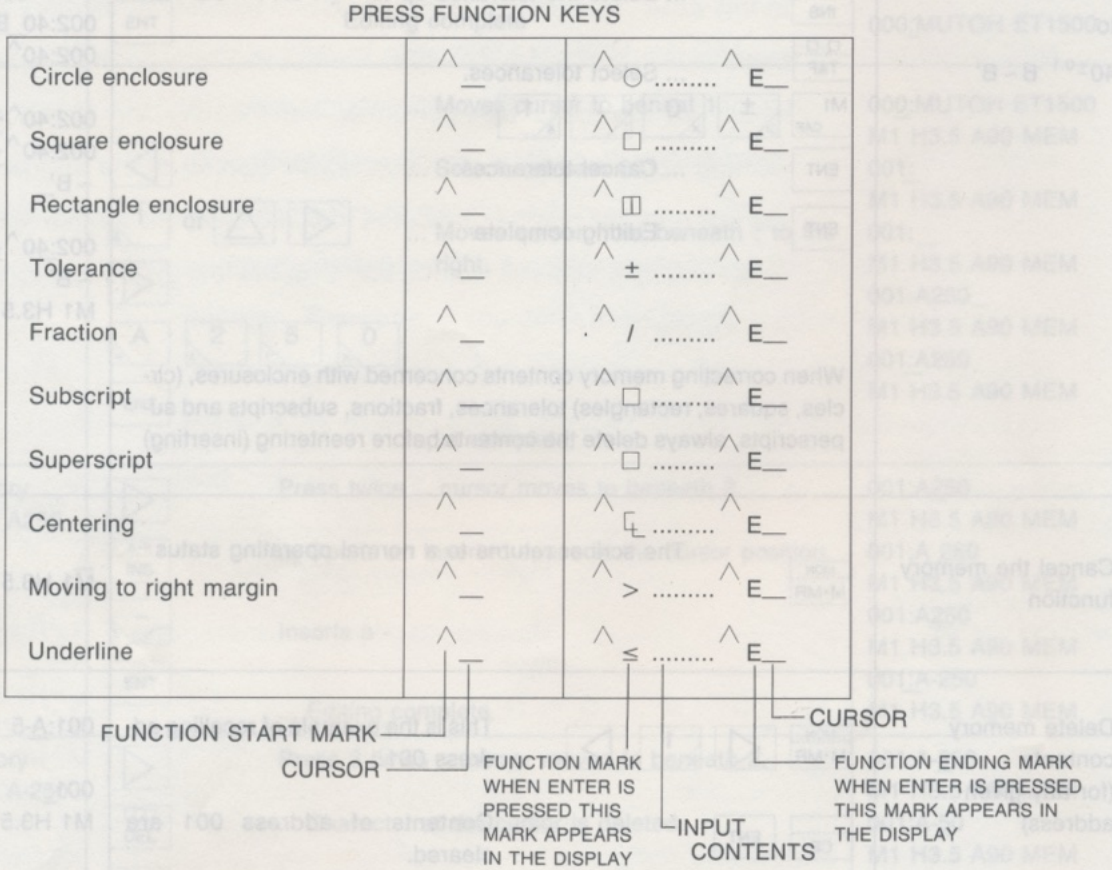
Plotting Example	Key Operation	Display (Upper / Lower)
Make the new input MUTOH JAPAN	MON M•MR — Perform memory input/output ▷ — Move the cursor from beneath the : to the right. M U T O H SPC / J A P A N • — Input ENT — Input complete	000:_ M1 H3.5 A90 MEM 000:_ M1 H3.5 A90 MEM 001 000:MUTOH _ M1 H3.5 A90 MEM 007 000:MUTOH JAPAN._ M1 H3.5 A90 MEM 013 000:MUTOH JAPAN. M1 H3.5 A90 MEM
Plot from the current pen stopped position	STA	000:MUTOH JAPAN.
Plot from the plotting area origin position	STOP STA	000:MUTOH JAPAN.
Plot after a carriage return	↵ STA	000:MUTOH JAPAN.
Overlay plot the same contents (return plotting)	← STA — Pen returns to M and performs return plotting	000:MUTOH JAPAN.

Plotting Example	Key Operation	Display (Upper / Lower)
Change memory contents MUTOH JAPAN to MUTOH ET1500	▷ Press 7 times ... cursor moves to below J. E T I 5 O O ENT Editing complete	000:MUTOH JAPAN. 000:MUTOH ET1500_ 000:MUTOH ET1500
Change from address 000 to 001 Input A250	... Moves cursor to beneat 1. ◁ ... Selects address 001. 1 or △ ▷ ... Moves cursor from beneath : to the right. ▷ A 2 5 0 ENT Input complete	000:MUTOH ET1500 M1 H3.5 A90 MEM 001: M1 H3.5 A90 MEM 001:_ M1 H3.5 A90 MEM 001:A250_ M1 H3.5 A90 MEM 001:A250 M1 H3.5 A90 MEM
Change memory contents from A250 to A-250	▷ Press twice ... cursor moves to beneath 2. A·K INS ... Opens an inserted space at the cursor position. − Inserts a - ENT ... Editing complete	001:A250 M1 H3.5 A90 MEM 001;A 250 M1 H3.5 A90 MEM 001:A250 M1 H3.5 A90 MEM 001:A-250 M1 H3.5 A90 MEM
Change memory contents from A-250 to A-5	▷ Press 3 times ... cursor moves to beneath 2. DEL ... Character at the cursor is deleted. ▷ ... Move the cursor to beneath 0. DEL ... Delete the character at the cursor. ENT ... Editing complete.	001:A-250 M1 H3.5 A90 MEM 001:A-50 M1 H3.5 A90 MEM 001:A − 50 M1 H3.5 A90 MEM 001:A − 5_ M1 H3.5 A90 MEM 001:A − 5 M1 H3.5 A90 MEM
Input $40^{+0.1}_{-0.2}$ B ~ B' (Address 002)	◁ 2 ▷ Select address 002 and move cursor to the right of :. 4 0 □.□ T&F ... Specify tolerances and fractions. + 0 · 1 − 0 · 2 ENT ... Cancel tolerances and fractions. B M2 SMALL ~ M1 CAP B M4 FIG ENT ... Input complete	002:_ M1 H3.5 A90 MEM 002:40_ 002:40^_ 002:40^+0.1F_ 002:40+0.1F−0.2_ 002:40^±+0.1F−0.2^ E_ 002:40^±+0.1F−0.2^ EB ~ B_ 002:40^±+0.1F−0.2^ EB ~ B' M4 H3.5 A90 MEM

Plotting Example	Key Operation	Display (Upper / Lower)
Change memory contents from $40^{+0.1}_{-0.2}$ B~B' to $40^{\pm 0.1}$ B~B'	▷ Press three times. □□□ DEL .. Move cursor to below the ^ A·K INS ... Delete the tolerance up to ^ ±+0.1F-0.2^E. □.□ T&F ... Select tolerances. M1 CAP ± > . 0 × • : 1 & ENT ... Cancel tolerances. ENT ... Editing complete When correcting memory contents concerned with enclosures, (circles, squares, rectangles) tolerances, fractions, subscripts and superscripts, always delete the contents before reentering (inserting)	002:40^±+0.1F-0.2^ EB~B' 002:40B~B' 002:40_B~B' 002:40^_~B' 002:40^±0.1_ 002:40^±±0.1^EB ~B'_ 002:40^±±0.1^EB ~B' M1 H3.5 A90 MEM
Cancel the memory function	MON M·MR The scriber returns to a normal operating status	M1 H3.5 A90***
Delete memory contents (for any given address)	MON M·MR ◁ 1 & ▷ This is the example of recalling address 001. CE ENT Contents of address 001 are cleared.	001:A-5 001: M1 H3.5 A90 MEM
Clear contents of all addresses in memory.	Press the CLEAR key while holding down the RESET (red) button. Then stop pressing the CLEAR key and first after the RESET button. *This should be done if a power failure or other problem occurs during memory input and when all memory contents are being changed.	
Copying memory contents	MON M·MR ◁ △ For example, the address 001 is called up. ◁ ◁ A·K INS 9 9 9 Specifies the address for copying. ENT Completes copying.	001:A-5 001:A-5 999 : 001 : A-5

- Memory and Monitor Plotting Display

  The displayed indicators for enclosures (circles, squares and rectangles), tolerances, fractions, subscripts, centering, moving to right margin, underline and superscripts are as follows.



- Insertions, deletions and corrections are made in the range ^.....^E.
  - ○ Correction of the ..... part before the function completed (E for Enter key) mark is made by entering exactly the same number of characters as were deleted using the delete key.
  - ○ For the ..... part after the function end mark appears (when the Enter key is pressed):

    (a) For monitor plotting, press the clear key and enter once again.

    (b) For memory plotting, move the cursor to the function start mark ... E and delete using the delete key. To change contents, press the insertion key or perform new input.

- Entering Graphics into Memory
  - When entering rectangles, circles, concentric circles, ellipses, triangles, parallel lines and straight lines into memory, after pressing the enter key to enter the various settings, press the enter key once more so that the cursor is positioned below the : .
  - When recalling such graphics from memory, the first time the start key is pressed the pen will move to the origin of the graphics recalled and stop. Pressing the start key once again starts actual plotting.
  - Editing of graphics entered into memory is performed by deleting all setting conditions using the delete key and reentering.
- For the memory input at time of using the backup memory module cassettes, please copy "a table of memory addresses" at the end of this manual and use this for reference purposes.

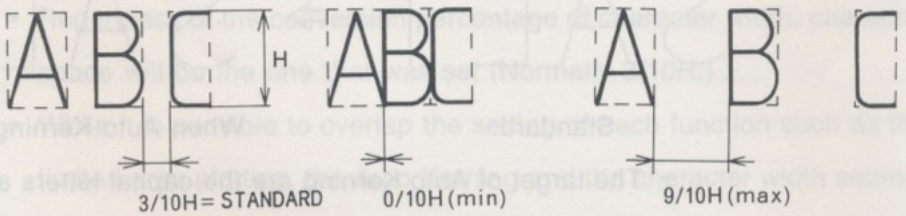
4.4.9 Monitor Plotting and Editing

- The monitor plotting mode is used to verify the characters to be plotted on the display before plotting. When doing this, the method of editing the display contents (i.e., performing insertion, deletion and corrections) is the same as for memory plotting.
  - After verifying the display contents, to plot the display contents press the start key or the enter key.
  - Even after plotting has been completed, the display contents are held and, in the same manner as for memory plotting, overlaid (return) plotting is possible.
  - If actual plotting is not required, press the " CE " key and the display will be erased.
  - Up to 200 characters may be monitored.
  - For the input of monitor plotting and editing, the position of cursor is count-indicated at the lower part of the LCD.

Plotting Example	Key Operation	Display (Upper / Lower)
Plot MUTOH SCRIBER	SHIFT MON(M•MR) M U T O H S C R I B E R ENT	MUTOH_ M1 H3.5 A90 MON 006 MUTOH↵SCRIBER_ M1 H3.5 A90 MON MUTOH↵SCRIBER M1 H3.5 A90 MON
Change data contents from MUTHO to MUTOH (partial change)	SHIFT MON(M•MR) M U T H O ◁ ◁ ... Move cursor to beneath H. O H ENT When a correction is completed, plotting begins.	MUTHO_ MUTHO MUTOH M1 H3.5 A90 MON
Change monitor contents from MUTOH to SCRIBER (full change)	SHIFT MON(M•MR) M U T O H CE S C R I B E R ENT	MUTOH_ _ SCRIBER
Make an overlaid plot of the same contents (return plotting)	← STA	SCRIBER M1 H3.5 A90 MON
Cancel monitor plotting	SHIFT MON(M•MR)	M1 H3.5 A90***

4.4.10 Character Spacing Setting Method

- Standard character space in the initial status is always 3/10H.
- The character spacing can be set in the range 0/10H through 9/10H steps.
- The character spacing setting value may not be stored.

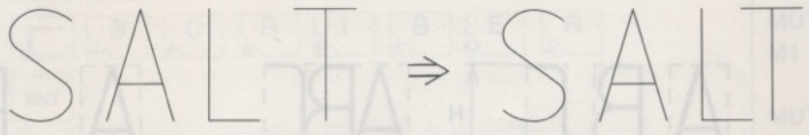


- When the character spacing is set, equal interval plotting is not possible.
- Tolerances, fractions, subscripts and superscripts cannot be plotted using the character spacing setting method.

Plotting Example	Key Operation	Display (Upper / Lower)
Set the character spacing to 2 times the standard (i.e., 6/10H)	STOP ... To return to origin. CHR-W / CHR-S ... Select character spacing setting. 6 ... Input numerator of 6/10H character spacing. ENT ... Seting complete.	M1 H3.5 A90 P = _/10H M1 H3.5 A90*** □□ P = 6/10 H M1 H3.5 A90*** □□ M1 H3.5 A90*** □□
Cancel character spacing setting.	CHR-W / CHR-S ... When cancelled, return is made to the standard mode.	M1 H3.5 A90*** **

4.4.11 Auto Kerning

- This is a function to make the spaces between the adjacent characters look uniform.



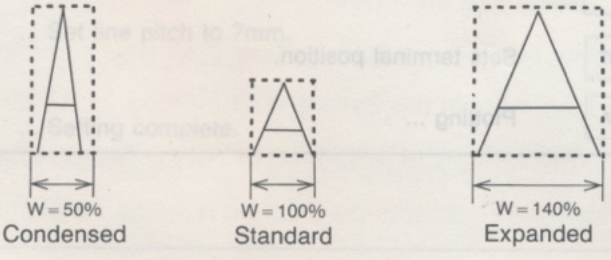
Standard. When Auto Kerning is set.

- The target of Auto Kerning are the capital letters and the small letters of the alphabet. (Numerals are excluded.) In addition, the capital letters after the small letters of the alphabet are also out of the target.
- The spaces between the adjacent characters differ depending upon the characters inputed.
- With the Auto Kerning, character spacing setting, equal space setting and limited area plotting cannot be performed.
- The function of Auto Kerning cannot be stored in memory, but characters can be plotted by selecting the Auto Kerning function after recalling a memorized text.

Plotting Example	Key Operation	Display (Upper / Lower)
Setting and release of Auto Kerning	SHIFT + A·K INS	M̄1 H3.5 A90 ... AK ...

4.4.12 Change of Character Width

- This function enables changing of only the capital and small letters of the alphabet, numerals, marks and symbols relating to the alphabet from minimum 50% to maximum 140% in the units of 10% with the normal (standard letter style) character width as 100%
- Regardless of the conversion percentage of character width, character space will be the one that was set (Normally 3/10H.)
- While it is possible to overlap the setting of each function such as the limited area plotting, the Auto Kerning and the character width setting, it is impossible to overlap the setting with the equal spacing and the decimal tab function.
- The setting value of character width conversion percentage cannot be stored in memory.



Plotting Example	Key Operation	Display (Upper / Lower)
Plot CONDENSE with 50% conversion. CONDENSE	SHIFT CHR-W CHR-S — Commamnds character width change ... 5 0 ENT — Set conversion percentage ... C O N D E N S E	CHANGE␣WIDTH␣W= ␣␣␣% M1 H3.5 A90 ... CW ... M̄1 H3.5 A90 ... CW ... CONDENSE_ M1 H3.5 A90 ... CW ...
Plot EXPAND with character space 0/10H, 140% conversion. EXPAND	CHR-W CHR-S 0 ENT SHIFT CHR-W CHR-S 1 4 0 ENT E X P A N D	M̄1 H3.5 A90 ... □ □ ... M̄1 H3.5 A90 ... □W ... EXPAND_ M1 H3.5 A90 ... □W...

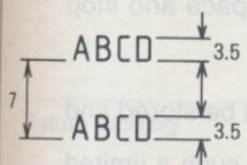
4.4.13 Underline Function

- Only the solid line type is available. This plots a section of a line 1mm underneath the base line regardless of the character height.
- This underline function works only for monitoring and storing in memory.
- This underline function is not applicable to the automatic dimension plotting.

Plotting Example	Key Operation	Display (Upper / Lower)
Plot UNDER.L with monitor plotting.	SHIFT, MON M·MR U N D E R · L — Character-string input. ◁ ◁ ◁ ◁ ◁ ◁ ◁ HS UNDER-L, 1 — Commands setting of underline ... ENT — Sets terminal position. STA — Plotting ...	M1 H3.5 A90 MON ..... UNDER.L_ M1 H3.5 A90 MON ..... 1 UNDERLINE 2 CANCEL M1 H3.5 A90 MON ..... UNDER.L M1 H3.5 A90 MON ... ^≤UNDER.L^E M1 H3.5 A90 MON .....

4.4.14 Line Spacing Setting Method

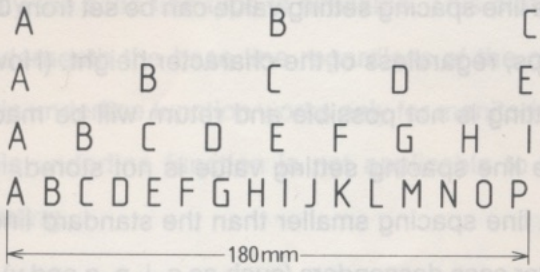
- The line spacing setting value can be set from 0.1mm to 40mm in 0.1mm steps, regardless of the character height. (However, 40mm double-line plotting is not possible and return will be made to the origin.)
- The line spacing setting value is not stored.
- If a line spacing smaller than the standard line spacing is set, English lower case descenders (such as g, j, p, q and y) may overlap with characters in the line below.

Plotting Example	Key Operation	Display (Upper / Lower)
Make a carriage return at 7mm intervals for characters 3.5mm high to align with the lines on ruled paper. 	[STOP] ... Return the pen to the origin if necessary. [CHR-B / LINE-S] ... Select line spacing setting. [7] ... Set line pitch to 7mm. [ENT] ... Setting complete.	M1 H3.5 A90 P=_ M1 H3.5 A90*** **↵ P=7_ M1 H3.5 A90*** **↵ M1 H3.5 A90*** **↵
Cancel line spacing setting	[CHR-B / LINE-S] ... When cancelled, return is made to the standard mode.	M1 H3.5 A90*** ***

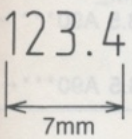
4.4.15 Limit Area Plotting Setting and Operation Method (Automatic Character Spacing Adjustment function)

- The character spacing is automatically adjusted, depending upon the number of characters to be plotted within the limited area.
  - The number of characters is between 2 and 200.
  - The limited area dimensions (maximum of 180mm) can be set in 0.1mm units up to 100mm and 1mm unit above 100mm.

○ The minimum character spacing is 1/10H.



- The three limiting conditions of character height, inclination angle and area dimensions exist, with the character height and inclination angle being the currently set value.
- If the characters specified do not fit within the set area dimensions, the characters which do not fit within the area are indicated flashing on the display. If this occurs, reduce the character height until the flashing characters disappear.
- For plotting operations other than return plotting (backspace and stop key), cancel the limited area plotting.
- The contents to be plotted within the limited area may not be stored and memory contents may not be recalled for plotting within such a limited area.

Plotting Example	Key Operation	Upper Display / Lower
With a character height of 3.5mm, plot 123.4 in a space 7mm wide.  	STOP ... Return to origin.	M1 H3.5 A90
	MAR ACS ... Specify limited area plotting	1x = _ M1 H3.5 A90***←→
	7 ... Input area dimensions.	1x = 7_
	ENT ... Setting complete	1x = 7.0 123.4
	1 2 3 . 4 ... Input characters to be plotted.	1x = 7.0 123.4_
	ENT ... Input complete	1x = 7.0 123.4 M2 H3.5 A90***←→
Change character height to 2.3mm.	2 . 3 ENT STA ... Plot (display is not blanked after plotting is completed)	1x = 7.0 123.4 M1 H2.3 A90***←→
Return plotting	STOP STA Return to the origin to start plotting.	
	STA Return from any given pen stopping position the number of blocks required for 123.4	1x = 7.0 123.4 M1 H2.3 A90***←→
Cancel limited area plotting	MAR ACS ... When cancellation is made, return is made to the standard mode.	M1 H2.3 A90***

4.4.16 Margin Shift (Line Return Position Setting)

- The setting position will be the space key step, in each step related to the currently set character height. Only one setting location is made.
- A carriage return position can be stored in memory.

Plotting Example	Key Operation	Upper Display Lower
Set the desired carriage return position (character height = space width)	SHIFT MAR ACS ... Select margin position setting SPC Plotting area Press any number of times ENT ... Setting complete Return position STOP Move to the beginning of the next line.	M̄1 H3.5 A90*** ←M ␣␣␣_ M1 H3.5 A90*** ←M ␣␣␣M_ M1 H3.5 A90*** ←M M̄1 H3.5 A90***← M
Cancel carriage return position setting	SHIFT MAR ACS Cancellation returns to the standard mode.	M̄1 H3.5 A90*** ... ***

4.4.17 Tab Setting

- The setting position is made in by using the space key, each space key step related the currently set character height.
- Ten locations may be set.
- The tab space causes space to the next set tab to be left blank whenever the TAB TAB-S key is pressed.
- The tab setting can be stored in memory. In addition, at time of memory setting, input of characters can be done simultaneously with the tab setting.
- With the tab setting position stored in memory, its address can be called up and if the STA key is pressed, the setting will be transferred to a direct plotting after a memory release.
- However, please check and confirm the tab set position after the memory release, using the tab space key TAB TAB-S
- If the tab is to be set in less than 10 locations, it may be set across the line. Once set, the tab will work even from the second line onward.

4.4.18 Decimal Tabulation

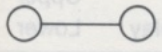
- This function divides the figures with the decimal points in the center to the direction of carriage return by means of the equal space plotting. The character width of the decimal point will be 4/10H.
- Only a decimal point is the character that can be inputted at the setting position.
- Decimal tabs may be set in less than 10 locations.
- The decimal tab setting can be stored in memory. At time of memory setting, the decimal tab setting and input of the characters can be carried out simultaneously.
- When the decimal tab set position is stored in memory, if the address is called up and the STA key is pressed, the setting will be transferred to a direct plotting after a memory release.

Plotting Example	Key Operation	Display (Upper / Lower)
Set at desired two locations with memory mode using backup memory cassette.	MON M·MR, ▷ } Set memory	000 : M1 H3.5 A90 ME1 000 :_ M1 H3.5 A90 ME1 □ .
	SHIFT, □.□ T&F — Commands setting of decimal tab.	
	SPC, × Desired frequency, ENT } Set at 1st location.	00 :␣␣␣␣␣␣D_ M1 H3.5 A90 ME1 008 □ .
	SPC, × Desired frequency, ENT } Set at 2nd location. (Input a space that is more than the added figure of fraction line of 1st location and maximum integer line of 2nd location.)	000 :␣␣␣␣␣␣D␣␣␣␣␣␣D_ M1 H3.5 A90 016 □ . 000 : ␣␣␣␣␣␣D␣␣␣␣␣␣D M1 H3.5 A90 006 □ .
	1058.3 ENT 294.67 ENT — Input characters ...	000 : ␣␣1058.3␣␣294.67_ M1 H3.5 A90 016 □ .
	STA	

Plotting Example	Key Operation	Upper Display / Lower
Set two tabs at desired locations (character height = space width)	SHIFT + TAB/TAB-S Desired no. of times → 1st tab setting SPC, ENT Desired no. of times → 2nd tab setting SPC, ENT STOP ... Return to origin First tab, Second tab, Plotting area	M̄1 H3.5 A90***T→ ␣␣␣T_ M1 H3.5 A90***...T→ ␣␣␣T␣␣␣␣T_ M1 H3.5 A90***...T→ M̄1 H3.5 A90***...T→
When backup memory cassette is used and memory input of tab set position is done.	MON/M·MR, ▷ SHIFT + TAB/TAB-S SPC, ENT → Set desired frequency and tab position.	000 :_ M1 H3.5 A90 ME1 000 : M1 H3.5 A90 ME1 ... 000 :␣␣␣␣␣␣T␣␣... M1 H3.5 A90 ME1 ...
When tab setting and character are mixed and memory input is done.	STOP Character input ▷ ×n, Character input ▷ ×n ... ▷ ×n What is left after 33rd character is scrolled to the left side. ENT → Determine memory contents.	000 :_␣␣␣␣␣␣T ... M1 H3.5 A90 ME1 ... 000 : ITEM␣␣␣T..... M1 H3.5 A90 ME1 ... 000 : ITEM␣␣␣T ... M1 H3.5 A90 ME1 ...
Tab space	TAB/TAB-S ... Leave blank spaces up to the next set tab. A beeper will sound if there is no next set tab.	
Cancel tab setting	SHIFT + TAB/TAB-S	M1 H3.5 A90***...**

4.4.19 Four-Direction Fine Adjustment

- For direct plotting only, it is possible to move the pen in 1/10H units in relation to the set value (character height). (This is only possible with the pen in the up position.)
- A step pen feed range is to be within a plotting range. However, in case the height is less than 1.8mm, it will be 0.18mm × 999 step-in 179.82 and movement up to direction limit will become impossible.
- The pen movement setting values may not be stored in memory.

Plotting Example	Key Operation	Display (Upper / Lower)
Join two M3 circles with a solid line 	M3 SIGN, W	○_ M3 H3.5 A90
	SHIFT, 1/10 h ROT	
	△ 5 times	STEP UP 5_ M3 H3.5 A90 ..... +
	◁ 3 times	STEP L 3_ M3 H3.5 A90 ..... +
	STOP ... Input end of pen movement.	M̄3 H3.5 A90
	L3 / L1 ... Plot solid line.	M̄3 H3.5 A90
	SHIFT, 1/10 h ROT	
	▽ 5 times ... returns the pen position to the baseline.	STEP UP 5_ M3 H3.5 A90 ..... +
	STOP ... Inputs end of pen movement	M̄3 H3.5 A90
	W	○_ M3 H3.5 A90
Cancellation Methods Change line Ex. 1 ------	STOP ... Return to plotting area origin.	M̄3 H3.5 A90
Ex. 2 ---------	... Move to the starting position on the baseline for the next line. (Unless a line spacing setting has been made, the pitch will be the standard pitch.)	F̄_ M3 H3.5 A90
Ex. 3	SHIFT, 1/10 h ROT	
	▽ or △ / ◁ or ▷ Up/down and left/right movement steps shown as 0. (Press the required number of times.)	STEP UP 0_ M3 H3.5 A90 ..... + STEP L 0_ M3 H3.5 A90 ..... +
	← Press the required number of times.	M̄3 H3.5 A90

4.4.20 Pen-up Move Function

- This checks the plotting exercises, setting position, etc., by driving the pen arm in a pen-up condition. This also checks and confirms the initial and final points of plotting.

Plotting Example	Key Operation	Display (Upper / Lower)
Release set pen-up move.	SHIFT PEN-UP SUB	M1 H3.5 A90 X
	STA — Pen arm moves to set position.	
	← — Returns to position before moving.	
	STOP	

4.4.21 Reversed/Rotated Plotting

- The plotting direction change command can be given as S = Standard, L = L90, 1 = 180, R = R90, X = XM, Y = YM (where M indicates mirror image reversal).

  1 S (STD, standard)

  2 L (L90, rotated left 90°)

  3 1 (180, rotated 180°)

  4 R (R90, rotated right 90°)

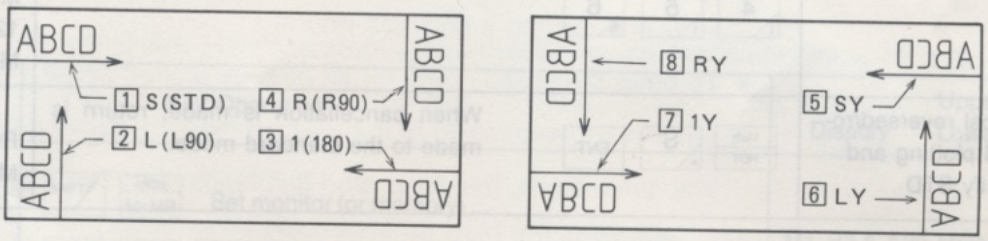
  5 SY = 1X (Same as Y-mirrored standard or X-mirrored 180° rotated)

  6 LY = RX (Same as Y-mirrored L90 or X-mirrored R90)

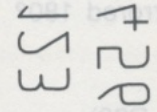
  7 1Y = SX (Same as Y-mirrored 180 rotated or X-mirrored STD)

  8 RR = LX (Same as Y-mirrored R90 or X-mirrored L90)

  Either specification has the same effect.

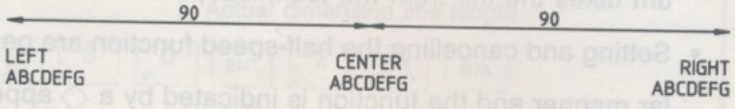


- If overlaid (return) plotting is required, use the monitor plotting mode.
- Since reversed/rotated plotting may not be stored in memory, the characters to be plotted should be stored in memory in the standard mode (S = STD), recalled and then changed in direction or orientation.

Plotting Example	Key Operation	Display (Upper / Lower)
	[1/2h ROT] ... Specify reversed/rotated plotting. [L] ... Specify direction (L90). [ENT] ... Move to the origin. [A] [B] [C]	ROT=_ M1 H3.5 A90 STD** ROT=L_ M1 H3.5 A90 STD** M1 H3.5 A90 L90** ABC_ M1 H3.5 A90 L90**
	[1/2h ROT] ... Specify reversed/rotated plotting. [R] [Y] Specify direction (R90, Y-mirrored). [ENT] ... Move to the origin. [1] [2] [3] ... Specify carriage return. [4] [5] [6]	ROT=_ M1 H3.5 A90 STD** ROT=RY_ M1 H3.5 A90 STD** M1 H3.5 A90 R90YM 123 M1 H3.5 A90 R90YM 123F_ M1 H3.5 A90 R90YM 123F456_ M1 H3.5 A90 R90YM
Cancel reversed/rotated plotting and specify STD	[1/2h ROT] [S] [ENT] When cancellation is made, return is made to the standard mode.	ROT=S M1 H3.5 A90 STD**

4.4.22 Moving Character-strings (Centering, moving to left and right margins)

- A function to divide a character-string of line unit at X-direction plotting area.



- This function works only for monitoring and memory plotting.
- When Auto Kerning, character spacing, equal spacing, etc. are set, movement takes place by each length of character-string as set.
- When a margin-left is set, the division will be made in the X-direction length minus the margin width.
- Although this function works with rotation/reversion, no overlap setting with a tab function is possible.

Plotting Example	Key Operation	Display
Plot centering character-string ABCDEFG by monitor, 180mm.	SHIFT MON M•MR — Set monitor (or memory) ...	M1 H3.5 A90 MON ....
	A B C D E F G — Input character-string ...	ABCDEFG_
		M1 H3.5 A90 MON ....
	SHIFT CHR-B LINE-S — Commands movement of character-string ...	1.LEFT 2.CENTER 3.RIGHT
	2 — Set by centering ...	M1 H3.5 A90 MON ....
		^ABCDEFG^E_
	STA — Plot ...	M1 H3.5 A90 MON ....

4.4.23 Half Speed

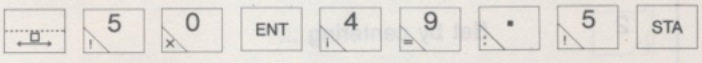
- When plotting a line between any two given points and when it is desired to make dense plotting lines on film or similar materials, half-speed plotting may be performed to improve the manner in which the drafting medium takes the ink from the technical pen.
- Setting and cancelling the half-speed function are performed in a similar manner and the function is indicated by a ◇ appearing in the LCD lower line.

Plotting Example	Key Operation	Display Upper / Lower
Half-speed setting and cancelling	SHIFT HS UNDER-L	M1 H3.5 A90 ....◇

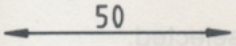
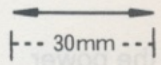
4.4.24 Automatic Dimension Plotting

- When the pen is positioned at the first line, this function should be used after first issuing a carriage return.
- To enter dimension lines for an already plotted set of graphics, if contraction and expansion of the drafting medium cause differences in actual dimensions, the dimension line length can be changed in units of 0.1mm.

  Example: To enter 50mm for an actual dimension of 49.5mm, use the following key sequence.



- Memory and monitor plotting of this function is not possible.

Plotting Example	Key Operation	Display (Upper / Lower)
Scale 1:1  	[□] [□] [5] [0] [ENT] [STA]	←→ M1 H3.5 A90 ←50→_ M1 H3.5 A90
Scale 1:2 	Actual dimension line length [□] [5] [0] [ENT] [2] [5] [STA]	←→ M1 H3.5 A90 ←50→25_ M1 H3.5 A90
L  	[□] [L] [ENT] ... Enter character. [3] [0] [STA] ... Enter dimension line length.	←→ M1 H3.5 A90 ←L→_ M1 H3.5 A90 ←L→30_ M1 H3.5 A90

4.4.25 Joint Plotting

- This function enables multiple plotting of some symbols of an application cassette.
- For operation and plotting examples, see the section on the application cassette operating procedure.

4.4.26 Repeated Plotting

- This function plots symbols from the application cassette repeatedly at a given set interval.
- For operation and plotting examples, see the section on the application cassette operating procedure.

4.4.27 Lettering Style Module Cassette

- If the module cassette is not used the standard font is ISO NORM (ISO 3098). Using the lettering style module cassette, however, the following types of fonts (upper/lower case and numerals) can be selected.
  - UNIVERSAL (American standard)
  - DIN-17, DIN-16 (DIN-16 is the italic version of DIN-17)
  - MUTOH Extra Light
  - MUTOH Extra Light outline
  - DIN-1451
- Only one lettering style module cassette can be inserted into the power unit. If more than one lettering style is required, insert the module required when plotting.
- The operation method consists of using the M2 mode for lower-case letters and numerals and the M1 mode for upper-case and numerals. When the shift button is pressed in the M2 mode, the following character only is plotted in the M1 mode (upper-case).
- Plotting conditions and other settings are the same as for the standard font. However, since the individual character widths will depend upon the fonts used, there will be differences in the number of characters plottable on a single line.

4.5 How to Use Module Cassette

4.5.1 Explanation of Module Cassette

In case the graphics and phrases prepared with a lettering machine, ET-1500 basic model, are to be used repeatedly, attaching backup memory module cassettes (memory cassettes) to [1MM] [2MM] will enable individual memory plotting. Available separately from these is an expansion module cassette [3MD] for various lettering styles.

4.5.2 Precautions in Handling

(1) Inserting and removing of the cassettes into and from the cassette ports of the power unit must always be performed with the power OFF (0) !

(2) Do not touch the loading terminals to the cassette ports.

(3) Please do not dismantle the cassette under any circumstances!

4.5.3 Preparation for Plotting

(1) Please make sure that the power is OFF (0).

(2) Two backup memory module cassettes can be inserted. If one is to be used, insert 1MM and if two are to be used, insert the second into 2MM.

(3) Please turn the power ON (1).

4.5.4 Backup Memory Module Cassette (memory cassette) [1MM, 2MM]

(1) Pressing the MON M·MR key after the cassettes are loaded will indicate "ME" on the 15—17th character each at the lower center of the LCD.

(2) When two cassettes are loaded, pressing of the key MON M·MR will indicate "ME1" and pressing the keys SHIFT MON M·MR will indicate "ME2". If the keys SHIFT MON M·MR are pressed in a condition where "ME2" is indicated, "ME1" will be indicated.

(3) Methods of memory plotting and editing are same as those for the standard (basic model). For memory plotting and editing method, please refer to 4.5.8.

However, a total capacity per one cassette is storing up to 7000 characters in memory.

(4) It will be convenient if the table of memory addresses at the end of this manual is copied and the contents are noted. In this way, the memory contents will not be forgotten.

4.5.5 Initialization of Memory Cassette

Prior to use, please carry out initialization on the new cassettes.

(1) Please insert a memory cassette into [1MM] port with the power OFF (0).

(2) While pressing the key [CE], turn the power ON (1).

(3) When pressing of the key [CE] is it will be automatically initialized. With this accomplished, this memory cassette is in a useable condition.

WARNING!

If initialization is done on a memory cassette, in which memory contents are written, the contents will all be erased. Also please note that only [1MM] is capable of initialization. Other ports not.

4.5.6 Copying of Memory Cassette

Memory cassettes can be copied to cope with such troubles as loss, damage and other unpredictable situations.

(1) Insert a master memory cassette into [1MM] and insert a new memory cassette into [2MM].

(2) While pressing the key [MON / M•MR], turn the power ON (1)

(3) On the upper part of the LCD,

MEMORY COPY 1MM→2MM STA or STOP_

will be indicated

(4) Pressing the key [STA], will start copying. Pressing the key [STOP], will return it to a normal operation. Pressing the key [STA], will operate as follows.

(5) When copying starts,

COPYING _

will be indicated.

(6) When copying is finished, confirm check will be carried out with the master and,

CONFIRMING_

will indicated.

(7) When confirm check is finished,

OK _

will be indicated.

Please turn the power switch OFF (0) and unload the cassette.

If the key [STOP] is pressed instead of the power OFF (0), it will return to a normal operation.

(8) In the event that the result of the comfirm check is incorrect,

COPY ERROR_

will be indicated.

Press the key [STA] and carry out the copying all once more.

(9) When uninitialized cassettes and other cassettes are loaded into the [1MM] cassette,

CAN NOT COPY (PLEASE CHECK 1MM)_

will be indicated.

In this case too, pressing the key [STOP] will return it to a normal operation.

4.6 Application Cassette Use

Application cassettes are provided as options and should be used according to instructions in this documents.

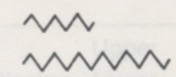
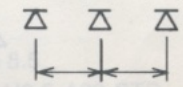
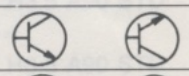
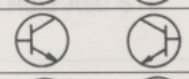
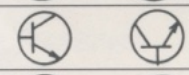
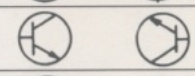
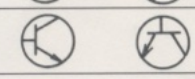
4.6.1 Application Cassette Description

The ET1500 Scriber basic model is provided with a standard alphabet, including symbols such as arrows (refer to as characters hereafter). The addition of an application cassette, however, can provide a variety of different character types.

4.6.2 Operating Precautions

- Insertion and removal of the cassette should always be done after switching the power to OFF (0). !
- Do not touch the terminals of the cassette port connector.
- Under no circumstances should the application cassette be disassembled.

4.6.3 Function Description

Function key		Function Description	Plotting Example
SS 2 1	1st special symbol mode key (SS)	Pressing this key enables the mode which calls the application cassette SS1. Pressing it once again cancels this mode.	
	2nd special symbol mode key (SS)	When the shift key and then this key is pressed, enables the mode which calls the application cassette SS2. Pressing it once again cancels this mode.	
L3 L1 L4 L2	Solid, single dot-dash, broken, dotted lines.	Press this key and select the line L1 or L3. For the other lines, L2 or L4, press the shift key and this key.	
	Height and angle changing	Press the height key and input the size of the character. For angle setting, press the angle key and input the angle of inclination. However, inclination for application graphics symbols is not possible.	
	Backspace	Moves the pen arm back one space. However, returns to the plotting origin for a graphics full area symbol	
	Carriage return	Moves the pen to the beginning of the next line (origin). However, returns to the plotting origin for a graphics symbol.	
JOIN REP	Joint	Repeatedly plots the same graphics symbol in the X direction. (Used for characters such as coils and resistors.)	
JOIN REP	Repeat	Repeats the same graphics symbol in the X or Y direction at a given set interval. Mirrored and rotated plotting is also possible.	
	X mirror	Plots characters mirrored about the X axis.	
	Y mirror	Plots characters mirrored about the Y axis.	
ROT	Left 90° rot.	Plots characters rotated left by 90°.	
	180° rot.	Plots characters rotaated by 180°	
	Right 90° rot.	Plots characters rotated right by 90°.	

4.6.4 Application Cassette Contents

The characters stored in application cassettes are recalled by key input of the codes on the application sheet provided with the cassette.

(Exmple) Electronic Cassette ETS-031

Code	001	002	003	004	005	006	007	008
Character	⊳	⊳						
Code								
Character								

(Charactre calling example)

To call → , enter the key sequence 003 or simply 3 only. The red on the characters shown on the application sheet indicates the plotting origin for that character. (Reference of positioning points)

4.6.5 Plotting Preparation

(1) Make sure the power switch is off (0).

(2) There are cassette ports (SS2 and SS1) on the power unit which enable two cassettes to be inserted simultaneously. Insert the cassette with the label to the front in a right position.

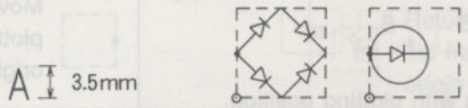
(3) Set the power to ON (1)

(4) Note that monitor plotting of application sheet characters (symbols) and memory input of these characters is not possible.

4.6.6 Changing the Character Height

When the power is switched ON, the initialized setting for the character height is 3.5mm for M1 through M4 and S1 through S2. However, the size of each character is proportional to the JIS symbol table. (The application sheet characters are expanded and reduced with relation to the frame.)

Initialized value



The point marked ⊙ is the plotting origin (frame origin).

The point marked · is the plotting base point (pen stopping point).

Plotting Example	Key Operation	Display (Upper / Lower)
Set height to 8.5mm	8 · 5 ENT 8.5mm (Characters) 8.5mm (Graphics) Pen arm moves to frame origin.	H=8.5_ S1 H3.5 A90 STD No=_ S1 H8.5 A90 STD

4.6.7 Character (Symbol) Plotting Examples

(a) General Plotting Method

Plotting Example	Key Operation	Pen Position	Display (Upper / Lower)
	0 0 1 ENT Move control unit main unit) to align the pen position with the plotting position. STA	Moves to plotting origin. Returns to plotting origin.	NO=001_ S1 H8.5 A90 STD NO=_ S1 H8.5 A90 STD
	0 6 8 ENT Align pen with plotting position. STA 0 7 2 ENT STA	Moves to plotting origin. Returns to origin Moves to plotting origin Returns to origin	NO=068_ S1 H8.5 A90 STD NO=_ S1 H8.5 A90 STD NO=072_ S1 H8.5 A90 STD NO=_ S1 H8.5 A90 STD
Return (overlaid) plotting	Press the same number once more.		

(b) Changed Direction Plotting Method

Changing the direction of characters may be done in any of the following methods with respect to the standard plotting direction (the • mark refers to the frame origin and the ⊙ refers to the plotting base point).

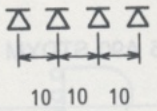
	Sandard (STD)	1/10 h ROT S ENT
	X-axis mirror (X MIR)	1/10 h ROT X ENT
	Y-axis mirror (Y MIR)	1/10 h ROT Y ENT
	Left 90° (L90)	1/10 h ROT L ENT
	180° (180)	1/10 h ROT 1 ENT
	Right 90° (R90)	1/10 h ROT R ENT

Plotting Example	Key Operation	Pen Position	Display (Upper / Lower)
Y-MIR	½ch / ROT, Y, ENT 0, 0, 4, ENT Align the pen to the plotting position. STA	Moves to Y mirror frame origin Moves to plotting base point Return to 1st frame origin	ROT=Y_ S1 H8.5 A90 STOYM NO=004_ S1 H8.5 A90 STDYM NO=_ S1 H8.5 A90 STDYM
Return direction to standard (STD)	½ch / ROT, S, ENT		ROT=S_ S1 H8.5 A90 STDYM

(c) Repeat Plotting

The same Character can be repeatedly plotted in the X or Y direction spaced at a set interval. This may be done in combination with changed direction plotting.

However, if the interval or number of characters to be plotted causes the plotting range (180mm in the X direction and 40mm in the Y direction) to be exceeded, a beeper will sound and the pen will return to the origin. In addition, if the spacing is specified as less than the character size, overlapping of characters will occur.

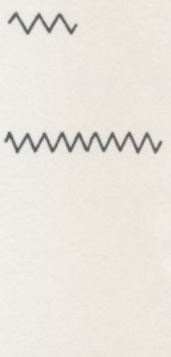
Plotting Example	Key Operation	Pen Position	Display (Upper / Lower)
Plot ▷| rotated 50° to the left in the X axis four times with a specing of 10mm.  	½h ROT, L, ENT — Specify direction	Move to L90 frame origin	ROT=L_ S1 H8.5 A90 STD
	JOIN REP — Specify repeat plotting		REF NO= S1 H8.5 A90 L90
	0, 0, 1, ENT — Input character code	Move to plotting base point	REP NO=001 X or Y?_ S1 H8.5 A90 L90
	X — Specify plotting direction		REP NO=001 X=_
	1, 0, ENT — Specify spacing		REP NO=001X =10n=_
	4, ENT — Specify no. of characters		REP NO=001X=10n=4 S1 H8.5 A90 L90
	Align pen with plotting position STA	Return to original frame origin	

*The direction change specification is made first, followed by the repeat plot specifications.

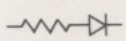
(d) Joint Plotting (This function may be used with only a limited type of symbol)

This function is used to produce coils, resistors and similar symbol characters by joining several of the same symbols in the X direction.

It may not be used in combination with changes of direction.

Plotting Example	Key Operation	Pen Position	Display Upper / Lower
Join 3 	SHIFT JOIN REP — Specify joined plotting		JOIN NO = _ S1 H8.5 A90 STD
	0 2 6 ENT — Input character codes	Move to plotting base-point.	JOIN NO = 026n = _
	3 ENT — Specify no. of characters		JOIN NO = 026n = 3 _ S1 H8.5 A90 STD
	Align pen with plotting position.		
	STA	Return to original frame origin.	

(e) Free Straight Line and Symbol Plotting (Combined)

Plotting Example	Key Operation	Pen Position	Display Upper / Lower
Join characters with solidline 	Align pen with plotting position.		NO = _ S1 H.5 A90 STD
	L3 / L1 — Plot solid line.		NO = _
	0 2 6 ENT	Move to character basepoint	NO = 026 _
	Align pen with plotting position.		NO = 026 _
	STA	Return to frame origin	NO = _
	Align pen with plotting position.		NO = _
	L3 / L1		NO = _
	0 0 1 ENT		NO = 001 _
	Align pen with plotting position.		NO = 001 _
	STA	Return to frame origin	NO = _
	Align pen with plotting position.		NO = _
	L3 / L1		NO = _ S1 H8.5 A90 STD

The 4-direction fine adjustment function cannot be used for the mode SS1 and SS2 of the application cassette. However, the function will work for the character-string.

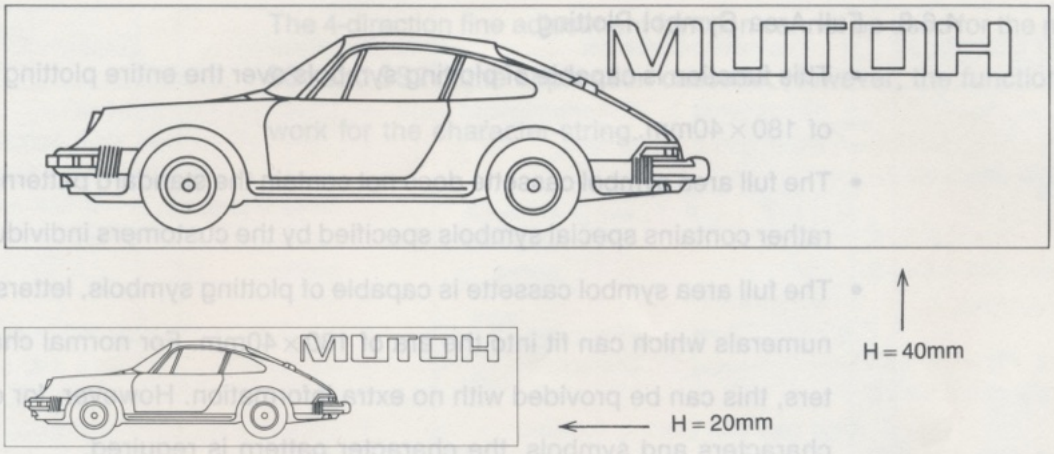
4.6.8 Full Area Symbol Plotting

- This function is capable of plotting symbols over the entire plotting area of 180 × 40mm.
- The full area symbol cassette does not contain the standard patterns but rather contains special symbols specified by the customers individually.
- The full area symbol cassette is capable of plotting symbols, letters and numerals which can fit into the ara of 180 × 40mm. For normal characters, this can be provided with no extra information. However, for other characters and symbols, the character pattern is required.
- Operation is the same as for other application cassettes, with the exception that rotation is not possible.

(Operating Procedure Example)

(1) Press the SS key which specifies the port (SS1 or SS2) into which the full area symbol cassette has been inserted.
(2) Specify the character height as H = 40mm.
(3) Input the number of the symbol to be plotted.
(4) Press the enter key to move the pen to the basepoint of the symbol
(5) Press the start key to start plotting the symbol

- For a height specification of H = 20mm, the symbol will be plotted reduced by a ratio of 20/40.



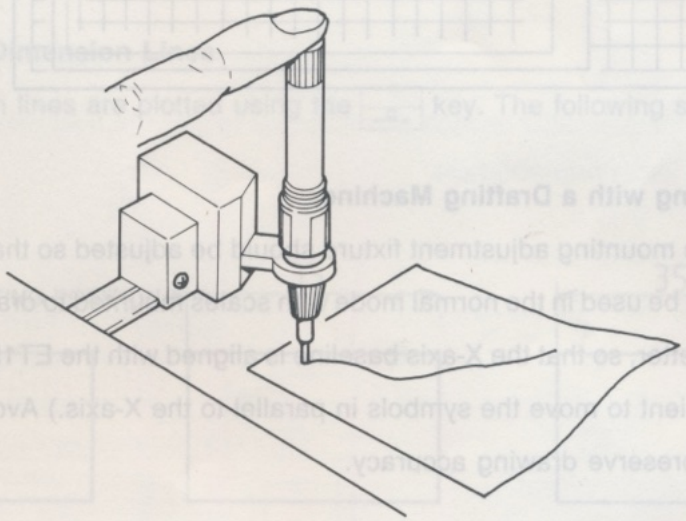
Plotting Example

5. USING CHARACTER AND PLOTTING FUNCTIONS

Section 4 described the basic use of the ET1500 and this section will describe the applications of the basic functions.

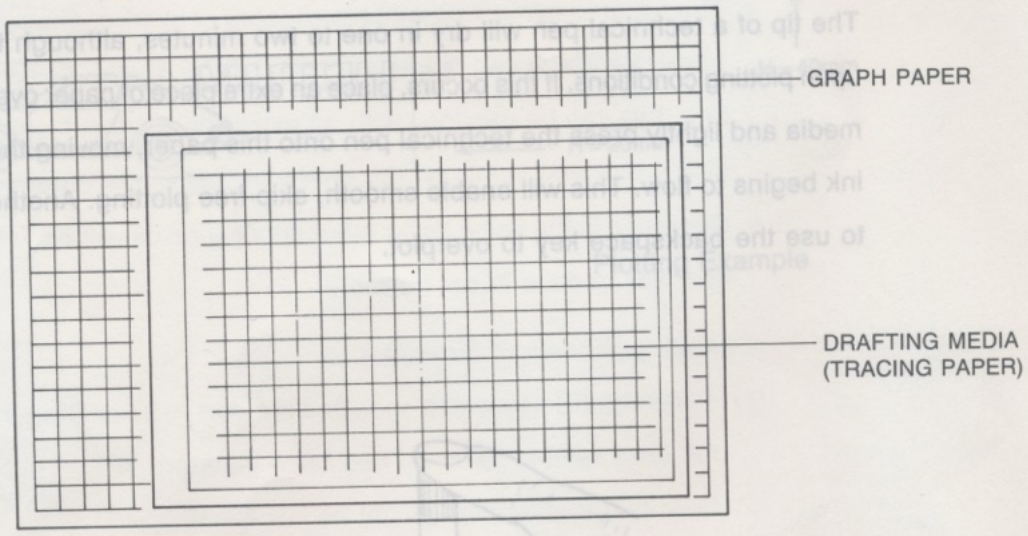
5.1 If Plotting is Interrupted

The tip of a technical pen will dry in one to two minutes, although this depends upon plotting conditions. If this occurs, place an extra piece of paper over the drafting media and lightly press the technical pen onto this paper, moving the paper until ink begins to flow. This will enable smooth, skip-free plotting. Another method is to use the backspace key to overplot.



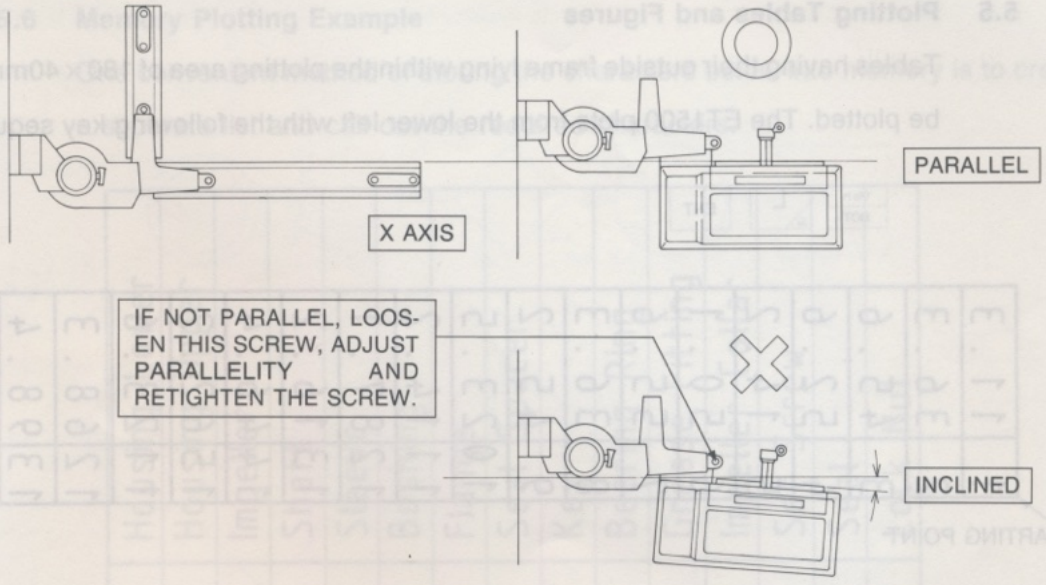
5.2 Using Graph Paper Effectively

When creating a drawing, a troublesome task is the penciling of guidelines. In such cases, graph paper can be placed beneath the main drafting media (this is suitable for electric, electronics, and instrumentation drawings).



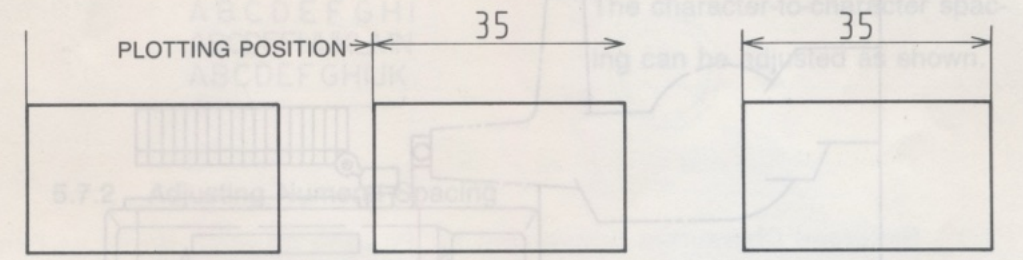
5.3 Using with a Drafting Machine

The mounting adjustment fixture should be adjusted so that the drafting machine can be used in the normal mode with scales mounted to draw and with the ET1500 to letter, so that the X-axis baseline is aligned with the ET1500 baseline. (It is convenient to move the symbols in parallel to the X-axis.) Avoid changing the angle to preserve drawing accuracy.



5.4 Plotting Dimension Lines

Dimension lines are plotted using the [ ] key. The following sequence should be used.



DRAW THE EXTENSION LINE ON ONE SIDE ONLY

USE THE ET1500 TO DRAW A DIMENSION LINE FROM THE PLOTTING POSITION

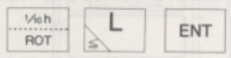
DRAW THE EXTENSION LINE ON THE OTHER SIDE

(Key Operations)

[ ] [ ] [3] [5] [ENT] Position [STA]

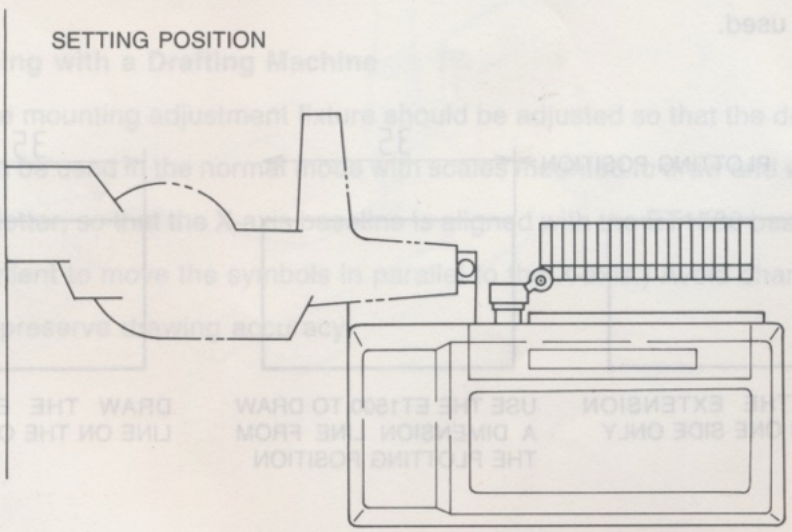
5.5 Plotting Tables and Figures

Tables having their outside frame lying within the plotting area of 180 × 40mm may be plotted. The ET1500 plots from the lower left with the following key sequence:



1	11.3
2	36.3
3	45.6
4	52.6
5	14.2
6	50.1
7	55.6
8	36.3
9	45.2
10	23.5
11	14.2
12	87.1
13	16.2
14	46.4
15	62.2
11	23.6
12	68.3
13	98.4

STARTING POINT



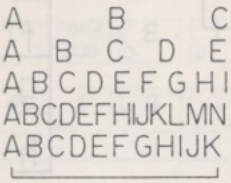
5.6 Memory Plotting Example

One convenient method of storing the characters below into memory is to create a separate list and call out the required characters.

1	Housing Lower
2	Housing Upper
3	Impeller
4	Shaft
5	Sleeve
6	Bushing
7	Flange
8	Seal Spacer
9	Key
10	Bearing Ring
11	Grease Fitting
12	Impeller Collar
13	Set Screw
14	Seal
15	Lock Nut

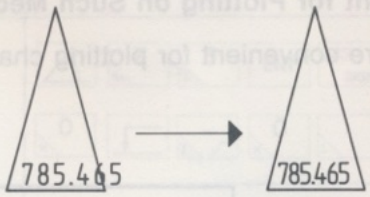
5.7 Limited Area Plotting Example

5.7.1 Convenient Plotting of Compressed Spaced Characters in a Limited Area



The character-to-character spacing can be adjusted as shown.

5.7.2 Adjusting Numeral Spacing

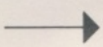


In the same manner numerals can be plotted in easy-to-read fashion.

5.7.3 Compressed Tables

The width can be made smaller to create a compressed table.

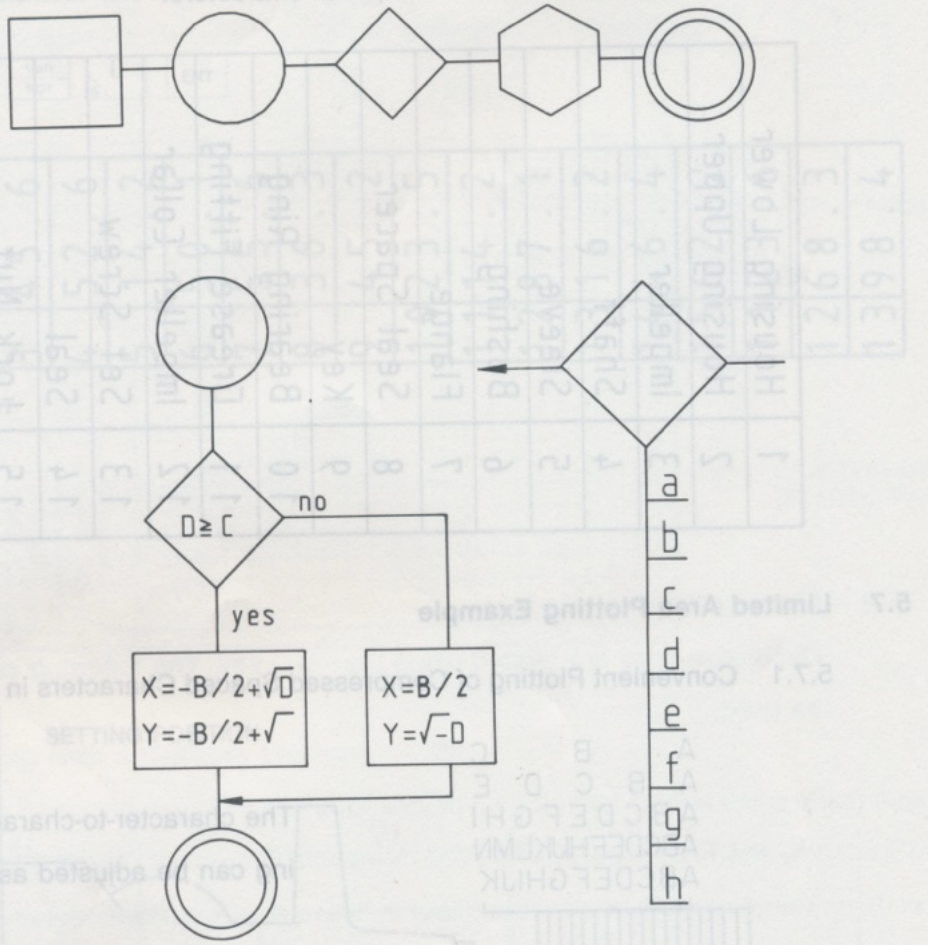
3	JIS B 1354 h7A 4×10
2	JIS B 1551 SN 506
1	JIS B 1523 1206K



3	JIS B 1354 h7A 4×10
2	JIS B 1551 SN 506
1	JIS B 1523 1206K

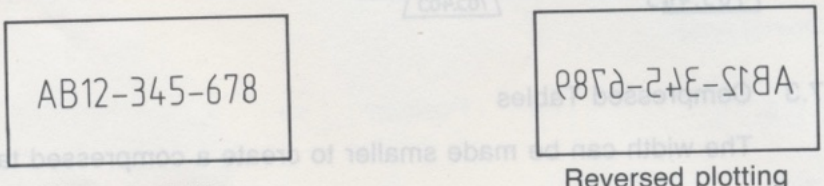
5.8 Continuous Plotting

The basic graphic functions can be combined to plot such as shown below.



5.9 Reversed Characters Convenient for Plotting on Such Media as Film

The reversal and rotation keys are convenient for plotting characters in reverse in such media as film.



Normal plotting direction

Reversed plotting direction

5.10 Tolerance, Fraction and Symbol Examples

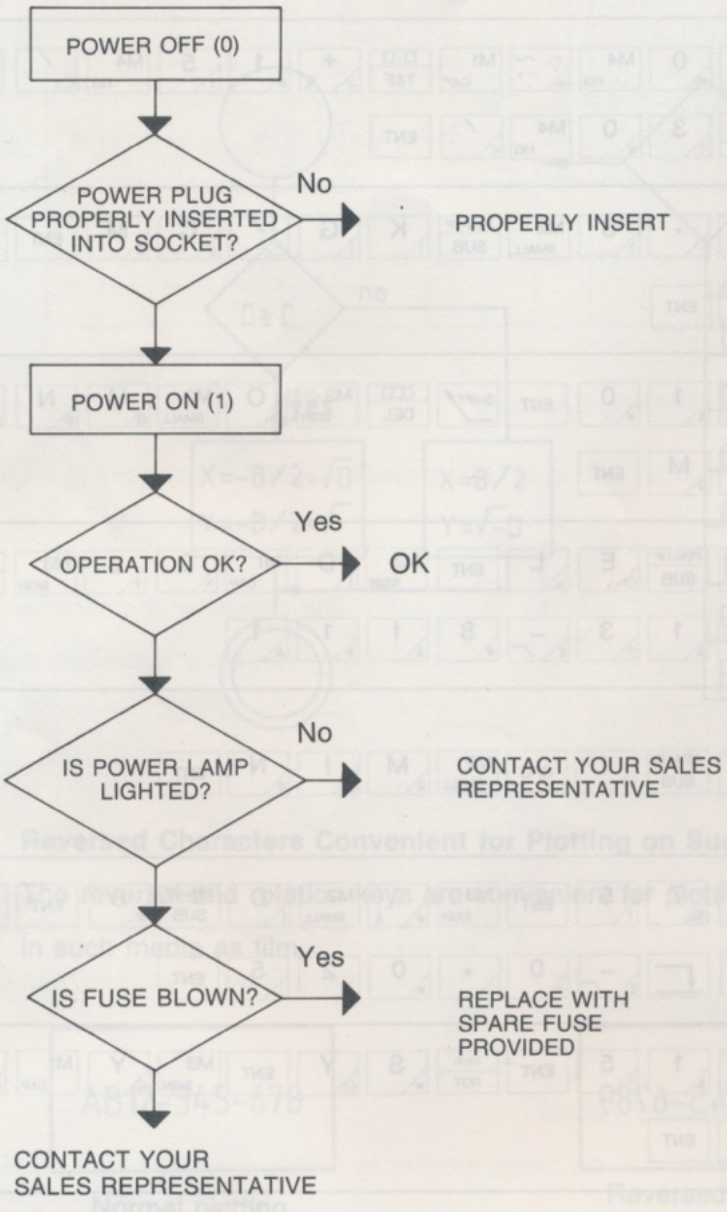
All key operations are made in direct plotting mode.

Plotting Example	Key Operation
40f7 ($^{29.980}_{29.959}$)	4 0 M2 SMALL F 7 M3 SIGN D □.□ T&F M1 CAP SPC 2 9 . 9 8 0 SPC 2 9 . 9 5 9 ENT M3 SIGN F
$30^{\circ}{}^{+15'}_{-30'}$	3 0 M4 FIG M1 CAP □.□ T&F + 1 5 M4 FIG M1 CAP − 3 0 M4 FIG ENT
$5.3kg/cm^2$	5 . 3 M2 SMALL PEN-UP SUB K G C M ENT PEN-UP SUB SPC 2 ENT
unit mm	1 0 ENT SHIFT DEL M3 SIGN O M2 SMALL U N I T SPC M M ENT
TEL(03)413-8111	T PEN-UP SUB E L ENT M3 SIGN D M1 CAP 0 3 M3 SIGN F M1 CAP 4 1 3 − 8 1 1 1
D1 min	D PEN-UP SUB 1 SPC M2 SMALL M I N ENT
Ød8 $^{0}_{-0.025}$	7 5 ENT M3 SIGN M2 SMALL D PEN-UP SUB 8 ENT □.□ T&F SPC 0 − 0 . 0 2 5 ENT
(123)	1 5 ENT ½h ROT S Y ENT M3 SIGN Y M1 CAP 1 2 3 ENT

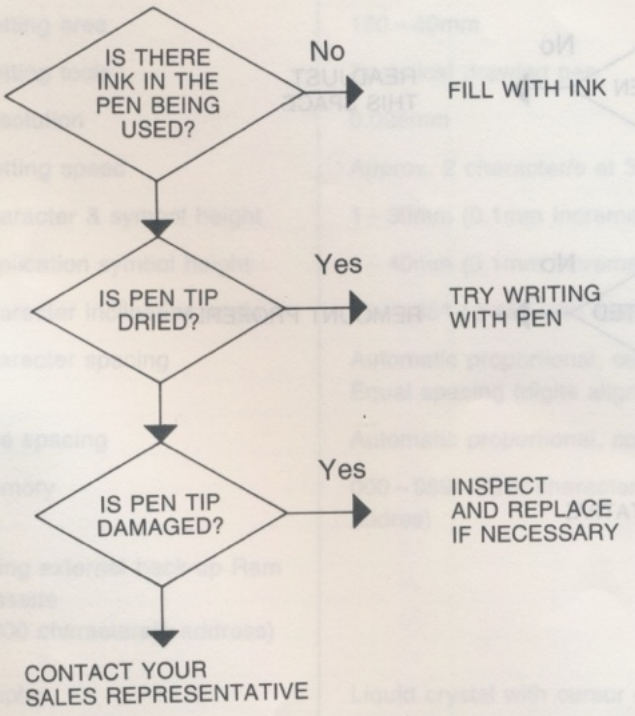
6. CHECKS TO BE PERFORMED WHEN YOU SUSPECT A FAILURE

Apparent improper operation of the ET1500 is often suspected to be a failure. To verify this, perform the checks described in sections 6.1 through 6.3.

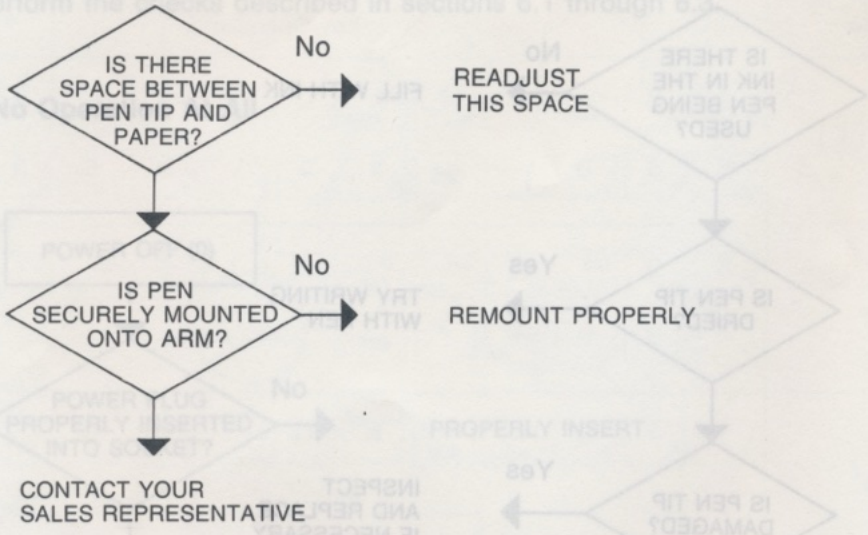
6.1 No Operation At All



6.2 Operation Possible But No Plotting is Performed



6.3 Poor Plotting Quality or No Plotting Possible



7. SPECIFICATIONS

Items	Specifications
Plotting area	180 = 40mm
Plotting tools	Technical drawing pen
Resolution	0.025mm
Plotting speed	Approx. 2 character/s at 3.5mm character height
Character & symbol height	1 ~ 30mm (0.1mm increments)
Application symbol height	1 ~ 40mm (0.1mm increments)
Character inclination angle	45 ~ 135° (±45° with respect to Y axis), 1° increments
Character spacing	Automatic proportional, conforming to ISO standards Equal spacing (digits aligned)
Line spacing	Automatic proportional, conforming to ISO standards
Memory	000 ~ 999 = 7000 characters (no limitation of capacity at each addres)
Using external back-up Ram cassette (1800 characters/1 address)	
Display	Liquid crystal with cursor and scroll function: 37ch × 2 lines = 64 characters
Keyboard	Flat-panel switches
Application cassettes	Two application cassettes (optional) installable
Font module cassette	Optional
MM Cassette (External memory cassette)	Two cassettes installable
Plotting type	Alphanumeric characters, upper case, lower case, numerals conforming to ISO standards Symbols conforming to ISO and JIS standards (partly Mutoh specified)
Operation unit dimensions	326 × 185 × 58mm
Operation unit weight	1.8kg (excluding connecting cable)
Power unit dimensions	239 × 118 × 83mm
Power unit weight	1.5kg
Power requirements	Adjustable via voltage selector pin to 90 ~ 130VAC or 200 ~ 260VAC, 50/60Hz
Fuse	1A (6.4 dia. × 30mm tubular type)
Power consumption	15W
Operating temperature	5 ~ 40°D
Storage temperature	−20 ~ 60°C

Name :
Date :

Adr.	Contents	Adr.	Contents
00		50	
01		51	
02		52	
03		53	
04		54	
05		55	
06		56	
07		57	
08		58	
09		59	
10		60	
11		61	
12		62	
13		63	
14		64	
15		65	
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